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A FRAMEWORK FOR THE IMPLEMENTATION OF E-PROCUREMENT

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The introduction of the Internet has challenged numerous value chain propositions and processes. Its low cost, low barrier of entry and timely distribution of information provides a seamless extension of processes across company borders. Especially in the business-to-business (B2B) realm, its introduction has however sparked criticism and controversy and many companies are still weary of trading on-line.

e-Procurement is a sound solution for companies to initiate the e-wave as it promises high cost savings. Savings promised include a reduction in processing cost, reduction in the supply base (which leads to cost savings) as well as negotiating better prices through the availability of sufficient post-purchase information. Maverick spending (off contract purchasing) is also reduced through better-controlled purchases.

A framework is developed in this research to assist in the evaluation of the suitability and scope of a proposed e-procurement implementation. Due to the numerous aspects involved in procurement and therefore also e-procurement, the following five dimensions are addressed in the framework:

1. **Procurement and Processes.** Although e-procurement does not address all procurement related aspects, such as strategic sourcing of supply, it has an operational focus and reduces processing time and costs.

2. **Products.** Products can be categorised by means of many different aspects, but the following main characteristics influence the categorisation decision: i) Its function within the organisation, ii) Product characteristics (homogenous or heterogeneous), iii) Product value and iv) Number of suppliers. Indirect goods with a low unit value, supplied by a large number of homogenous suppliers are regarded as susceptible for e-procurement.
3. **Purchasing role players.** Many different role players function within the purchasing arena, each influencing the purchasing function. The main aspects to be considered when considering e-procurement are: i) Buyer characteristics (demography and background), ii) Supplier characteristics and channel strategy (the supplier's position in the value chain as well, as if the relationship is cohesive or conflicting), iii) Market forces (supply and demand laws as well as market competitiveness) and iv) Industry related purchasing (the product purchased and its significance).
4. **Purchasing and Supply Chain Management.** The introduction of the Internet has opened up the possibility for planning across the supply chain planning, using techniques such as CPFR. This will result in a pull rather than a push model. For products to be ordered electronically, the following information should be available: i) Stock levels and ii) Current or forecasted demand. Absence of accurate information of any or both of the above would result in a preference for manual ordering.
5. **Trading and Information Exchange.** Each buying situation may require a different e-procurement solution. It is important that users firstly establish the commerce arena requirements (the product characteristics, sophistication of the buyers as well as inefficiencies of current transactions) which will influence the choice in e-procurement business model, trading platform, data format, etc.. Thereafter the aspects necessary for consideration are: i) The data format (XML vs. EDIFACT, etc.), ii) Information platform (Internet vs. Intranet, etc.), iii) Integration needs (integrating with back end systems such as an ERP system) and iv) Different e-procurement solutions.

Using a qualitative model considering dimensions 1 to 3 above, the susceptibility of different products or commodity groups (products with similar characteristics grouped together) should be examined. For each of these products or commodity groups the preferred e-procurement solution should be crafted by applying dimensions 4 and 5 above. Combining the qualitative ratings with the preferred solution should provide the most feasible e-procurement solution, while simultaneously rating which of the products should be purchased through the solution.



SAMEVATTING VAN VERHANDELING

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Die bekendstelling van die Internet het die waarde van baie waardekanale benaderings en -prosesse bevestig. Die lae koste, maklike toegang asook vinnige verspreiding van inligting het tot gevolg gehad dat prosesse oor maatskappy-grense heen strek. In die besigheid-tot-besigheid (B2B) omgewing het die Internet egter heelwat kontroversie en kritiek ontteken wat tot gevolg gehad het dat heelwat maatskappye steeds huiwerig is om aanlyn te handel.

e-Procurement is 'n goeie manier vir maatskappye om hulle aan die e-golf bloot te stel aangesien dit heelwat kostebesparings belooft. Besparings sluit in 'n vermindering in proses-koste, 'n vermindering van verskaffers (wat tot kostebesparings lei) sowel as die vermoë om beter pryse te onderhandel as gevolg van die beskikbaarheid van beter na-aankoop inligting. Aangesien aankope beter beheer word, verminder buite-kontrak aankope ook.

'n Raamwerk word ontwikkel navorsing in hierdie om te help in die evaluering van die mees gepaste e-aanskaffing oplossing. As gevolg van die talle aspekte betrokke in die aankope en derhalwe e-aanskaffing, word die volgende aspekte asook aanbevelings bespreek:

1. **Aankope en – Prosesse.** Alhoewel e-aanskaffing nie alle aankoop-verwante aspekte behandel nie, soos byvoorbeeld strategiese aanskaffing, het dit 'n operasionele fokus wat proses tyd en -koste verminder.
2. **Produkte.** Produkte kan op grond van baie aspekte geklassifiseer word, maar die volgende hoofkriteria is gebruik om die toepaslikheid van e-aanskaffing te bepaal: i) Die produk se funksie binne die organisasie, ii) Produk karakteristieke (homogeen of heterogeen), iii)



Produk waarde en iv) Aantal verskaffers. Indirekte goedere met 'n lae item waarde, verskaf deur 'n groot aantal verskaffers wat homogeen is, word as ontvanklink vir die implementering van e-aanskaffing beskou.

3. **Aanskaffing rolspelers.** Verskillende rolspelers funksioneer binne die aankooparena en beïnvloed aankope. Die hoofaspekte ter oorweging vir e-procurement is: i) Aankoper karakteristieke (demografie en agtergrond), ii) Verskaffer-karakteristieke en kanaalstrategie (die verskaffer se posisie in the kanaal asook die tipe verhoudings tussen verskaffers en aankopers), iii) Mark-kragte (verskaffings en aankoop wette asook mark-mededinging) en iv) Industrie-verwante aankope (die produk aangekoop en sy belangrikheid). Elk van die boogenoemde moet inaggeneem word om die toepaslikheid van e-aanskaffing te bepaal.
4. **Aankope en Verskaffings Kanaal Bestuur.** Die bekendstelling van die Internet het dit moonlik gemaak om oor maatskappy-grense heen te beplan. Tegnieke soos CPFR word hiervoor gebruik en bemaagtig 'n trek eerder as 'n stoot model. Sou produkte elektronies bestel word, is die volgende noodsaaklik: i) Elektroniese voorraadvlakke en ii) Huidige of vooruitgeskatte bestellings. Die afwesigheid van akkurate inligting van enige van die bogenoemde sal beteken dat bestellings nie elektronies sal kan plaasvind nie.
5. **Handel en Inligting Uitruiling.** Elke aankoop situasie benodig 'n verskillende e-aanskaffing oplossing. Dit behels die volgende aspekte: i) Die data formaat (XML, EDIFACT, ens.), ii) Inligtingsplatform (Internet, Intranet, ens.), iii) Integrasie behoeftes (integrasie met onder andere ERP oplossings) en iv) Verskillende e-procurement oplossings. Dit is belangrik dat gebruikers eerstens die handelsomgewing se behoeftes (die produk karakteristieke, gevorderdheid van aankopers asook die effektiwiteit van bestaande transaksies) bepaal, wat die keuse van e-procurement besigheidsmodel, inligtingsplatform, data formaat, ens. sal beïnvloed.

Deur gebruik te maak van 'n kwalitatiewe model vir dimensies 1 to 3 hierbo, kan die toepaslikheid van e-aanskaffing vir produkte of kommoditeitsgroepe (groepering van produkte met soortgelyke karakteristieke) bepaal. Vir elkeen van die produkte of kommoditeitsgroepe moet die aanbevole e-aanskaffing oplossing ook bepaal word deur gebruik te maak van dimensies 4 en 5 hierbo. 'n Kombinasie van die kwalitatiewe uitslae, asook die voorkeur e-aanskaffing oplossing, behoort die mees realistiese e-aanskaffing oplossing teweeg te bring. Terselfdertyd bepaal dit ook watter produkte deur die oplossing aangeskaf behoort te word.

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ABBREVIATIONS

Abbreviation	Description
APS	Application Service Provider
B2B	Business-to-Business
BEE	Black Economic Empowered
BOM	Bill of Materials
CPFR	Collaborative Planning Forecasting and Replenishment
ECR	Efficient Consumer Response
EDI	Electronic Data Interchange
EOQ	Economic Order Quantity
ERP	Enterprise Resource Planning
JIT	Just In Time
LAN	Local Area Network
M-Commerce	Mobile Commerce
MRO	Maintenance, Repairs and Operations
MRP	Materials Resource Planning
OEM	Original Equipment Manufacturer
RFQ	Request for Quotation
SCM	Supply Chain Management
SMME	Small, Medium and Micro Enterprises
SOW	Statement of Work
TCO	Total Cost of Ownership
VAN	Value Added Network
VPN	Virtual Private Network
XML	eXtensible Markup Language



GLOSSARY

1. **Application Service Provider (ASP).** Any organisation that hosts software applications on its own servers, providing customer access to the application through private lines or a public network.
2. **Auction-**
 - Dutch.** Bidding direction is downward, with the price declining at set times and set decrements until a buyer accepts the price.
 - English.** Bidding direction is upward, where all bids are visible to all. The auction ends when no new higher bid is made.
 - Japanese.** The bidding direction is upward, with the price rising in set increments and participants drop out until only the winning bidder remains.
 - Reverse.** The only differentiating characteristics are that the bidding direction is downward and that the buyer drives it. It can incorporate combinations of all other auction types.
 - Sealed-bid, first price.** The bidding direction is upward, with the submitted bid only visible to the auction-maker. The highest bidder wins and pays highest bid price.
 - Sealed-bid, second price.** The bidding direction is upward, with the submitted bid only visible to the auction-maker. The highest bidder wins and pays the second highest bid price.
3. **B2B.** (Business-to-Business) A term denoting e-commerce applications orientated to users acting in employee roles or to collaborating systems operated by business partners. In short: on-line commerce between one or more business partners.
4. **B2C.** (Business-to-Consumer) A term denoting e-commerce applications orientated to individuals acting in a personal or family capacity. In short: on-line commerce between a consumer and a business.
5. **CPFR.** It is a concept that allows collaborative processes across the supply chain, using a set of process and technology models. It is closely tied with similar efforts that have preceded it, such as ECR, Quick Response and Vendor Managed Inventory (VMI).

6. **E-Business.** Whereas e-commerce is concerned with using the commercial selling opportunities of the Internet, e-business is more concerned with moving all of the main functions of the company - sales, stock control, customer relationship management, etc. - onto the more dynamic medium of the World Wide Web.
7. **E-Commerce.** A modern business methodology making use of many enabling technologies in order to reach given commercial or consumer objectives. It is typically an on-line activity involving order and payments for goods or services.
8. **E-Marketplace.** A venue for trading between purchasers and vendors, hosted on the Internet by a third-party. The majority of such markets exist to serve a particular vertical market, and strive to offer relevant value-added services to industries within them.
9. **E-Procurement.** The act of Web-enabling the purchasing process, creating efficiencies and reducing costs by taking advantage of Internet-based technologies. The technology serves as a foundation for e-procurement, but the benefits arise through the change in business processes and outlook.
10. **Encryption.** A means of scrambling data to prevent it being read by anyone other than the intended recipient. The sender uses a key to encrypt the message: the recipient uses a decryption key. There are normally two kinds of encryption keys - a secret key and a public key.
11. **eXtensible Markup Language (XML).** XML provides functionality not available with HTML. XML supports links that point to multiple documents, whereas HTML links can reference just one destination.
12. **Firewall.** A combination of hardware and software that separates a Local Area Network (LAN) into two or more parts for security purposes. Firewalls are commonly used to protect the traffic in and out of Intranets, where potentially all services available to internal users can be offered to selective external users. The selection process which "decides" whether or not to authorise access is undertaken by the firewall.
13. **Infomediary.** A provider of specialised information on behalf of producers of goods and services and their potential customers. The term is a composite of information and intermediary.

14. **Internet.** The vast collection of inter-connected networks that all use the Transmission Control Protocol/Internet Protocol (TCP/IP), which evolved from the Advanced Research Projects Agency Network (ARPANet) of the late 1960s and early 1970s. The ability to transfer data in real-time via the Internet is an essential component of the e-business paradigm.
15. **Intranet.** A private network inside a company or organisation that uses the same kinds of software that can be found on the public Internet, but is only for internal use. Intranets are commonly protected from the Internet via a firewall, which selectively allows traffic to pass in both directions.
16. **M-Commerce.** (Mobile Commerce) Electronic commerce using mobile devices such as cell phones as clients.
17. **Maverick Spending.** When departments or individuals buy outside established purchasing channels, in the belief that a saving or shorter delivery lead-time can be achieved. Such false economies prevent the accumulation of bulk discounts, and ultimately cost the enterprise far more than can possibly be saved.
18. **Portal.** A portal can be defined as being a gateway to the World Wide Web, with examples including Yahoo and the Microsoft Network. It is a window into an integrated set of Internet-based information or business tools. From a B2B point of view it provides a single point of entry into a company's most important information- products services, operations and internal procedures- giving users access to all these applications within a few mouse-clicks from a master site.
19. **Supply Chain Management (SCM).** The process of enhancing a company's internal practices and its interaction with suppliers and customers, with the goal of bringing products to market more efficiently. Successful implementation of such procedures, usually in the fields of procurement, warehousing, and other related fields, offer a business a competitive edge in the ability to deliver products more cost effectively.



CHAPTER 1

INTRODUCTION TO THE RESEARCH DOCUMENT



1. INTRODUCTION TO THE RESEARCH DOCUMENT

1.1. Introduction

In recent studies many referrals to the importance and the impact of the Internet have been made. According to Sculley and Woods (1999:17), the Internet's main functions include:

- Provides interactive networks at a lower cost
- Provides a low barrier of entry for new companies
- Being the ultimate global distribution system

A further benefit is the dynamic information (such as pricing) it provides. Procurement is one of the first aspects to be tackled by the business-to-business e-wave. Thompson *et al.* (2000) refers to it as something that companies can test the water with and as the cost savings start realising, it can be implemented in other areas in a staggered approach.

One of the main reasons procurement was targeted first, is its large cost component to companies. According to Elliff (2001), a 1% improvement in the overall cost of purchased materials and services can increase a company's bottom line by 10-20%. Electronic procurement can therefore be of great benefit to companies, but as Thompson *et al.* (2000) states, both buyers and sellers need to develop effective strategies to exploit different and new channels, mechanisms and models, which may also mean working with customers, partners and rivals.

The name Electronic Procurement (or e-procurement) has, as the word indicates, two distinct aspects; *Procurement* as well as *Electronic* (or web enabled). According to the Oxford dictionary, *procurement* is "Obtaining by care or effort, acquire". Thus procurement has some element of effort to obtain items. The Word electronic refers to Electronic Commerce (or *E-commerce*). According to May (2000:2), *e-commerce* means selling items over the World Wide Web. Currently there is a lot of hype concerning this area (to some a magical marketing word that can be liberally sprinkled on any dish) and as yet there is no agreement about what *e-commerce* is or what might come to be. *E-commerce* is also perceived as the next wave in the evolution of business and it is where we are all migrating. It can therefore be assumed that *e-commerce* is a compact word for a wide array of interconnected business concepts, technologies, and cultural phenomena.



According to Elliff (2001), e-procurement is any purchasing-related activity that involves electronic communication, the Internet, or related software to help companies achieve increased value. From point-and-click ordering using Web-based catalogues of individual suppliers, to marketplaces that bring together in one place the products or services offered by multiple suppliers, to live auctions that determine the lowest-price bidder.

Dowling (2001) adds that e-procurement is an integrated system of services and technologies that provides a seamless bridge between buying and selling businesses. The e-procurement process begins at the planning stages within the buying company and extends through to the delivery and collections services of the selling company and the receipt and payment services of the buying company. e-Procurement shatters walls, enhances controls, and eliminates time delays between the requisition to receipt processes.

e-Procurement has created much speculation in the business arena. Some companies have implemented e-procurement at first sight. Some of these companies have shown measurable benefits in its first year, whilst other companies have shown little but “soft benefits” with promising tangible financial savings to follow. In a South African context, SASOL ventured with CommerceOne establishing a Portal, Marketsite Africa (www.marketsiteafrica.net), in the middle of 2000. Many other companies such as FirstRand and Naspers waited for this operation to show dividends before joining at the beginning of 2001.

According to Thompson *et al.* (2000), e-procurement's benefits are primarily seen in the indirect purchasing space with goods and services that are not directly linked to the manufacturing systems. The major benefits of e-procurement include the following:

- Reach that allows allowing suppliers to access new customers and buyers to find new suppliers.
- The ease of exchange of information, providing supply chain partners a “dashboard-type of view” of orders and service performance.
- Increased accuracy of information by reducing the number of data-entry points within the process. Key information is only entered once.
- Electronic routing that eliminates the problem of lost documents and the requirement for manual tracking. This makes for increased control and accountability for business procurement.
- Real-time tracking of order status.
- Payment for purchases can be automatically made upon automatic matching of the invoice with the delivery note and the purchase order. This processes enables shorter payment cycles, which allows more competitive pricing to be obtained from suppliers.

Richardson (2000:57) adds that the primary advantage is the reduced administration cost, as well as the administration burden taken away from the purchasing professional in an organisation.

1.2. Motivation for an e-Procurement Framework

According to CommerceOne (www.marketsiteafrica.net, 2000) the shift in design, planning, and supply chain management capabilities to the e-marketplace is essential for accommodating direct goods procurement using the many-to-one-to-many model. Each purchase, however, may contain numerous variables that must be resolved between the buyer and supplier. This complexity makes it considerably more complicated to handle procurement and supply chain collaboration online. To support the direct procurement and supply chain rigors, *the e-marketplace must be built with a framework that is capable of hosting the collaboration design process, variable specifications, vendor qualification, and joint production planning.*

According to Thompson, *et al.* (2000) businesses are competing increasingly on supply chain management. There is now increased recognition that in order to become a market leader, providing differentiated and customise products and services, the supply chain has to be managed as effectively as possible, and procurement is the first stage of this process.

It is therefore vital that the choice of an e-procurement solution, as well as the planning and installation involve much more than only system aspects. It should also encompass:

- Strategic procurement and its process.
- Supplier selection, management and relationship.
- System integration. It is important to integrate with existing systems such as back office and ERP systems.
- Managing of the supply chain and implementing an appropriate supply chain model.

To ensure that all aspects are integrated in the choice and deployment of an e-procurement solution, the development of a framework is proposed.

1.3. Aim of This Research

The research aims to develop a framework in the Business-to-Business (B2B) procurement arena that provides the following:

- A decision support model that will, given the company's industry, products and role players in procurement, determine if an e-procurement solution is applicable. The framework will also highlight which of the company's products are suited for web-based procurement.
- Assistance in the design of an e-procurement solution, giving an indication of:
 - The on-line business model (being either a buy-side, sell-side or marketplace solution). Recommendations will be made for choosing between a buy-side, sell-side or a marketplace solution.
 - The on-line architecture aspects that the solution should encompass. Aspects such as the data format used for information exchange (EDI vs. XML), integration with back-end systems (such as ERP), the trading platform (using the Internet, an Extranet or an Intranet) and security are discussed.

1.4. Research Overview

The aspects researched in the quest for an e-procurement framework are shown in Figure 1.

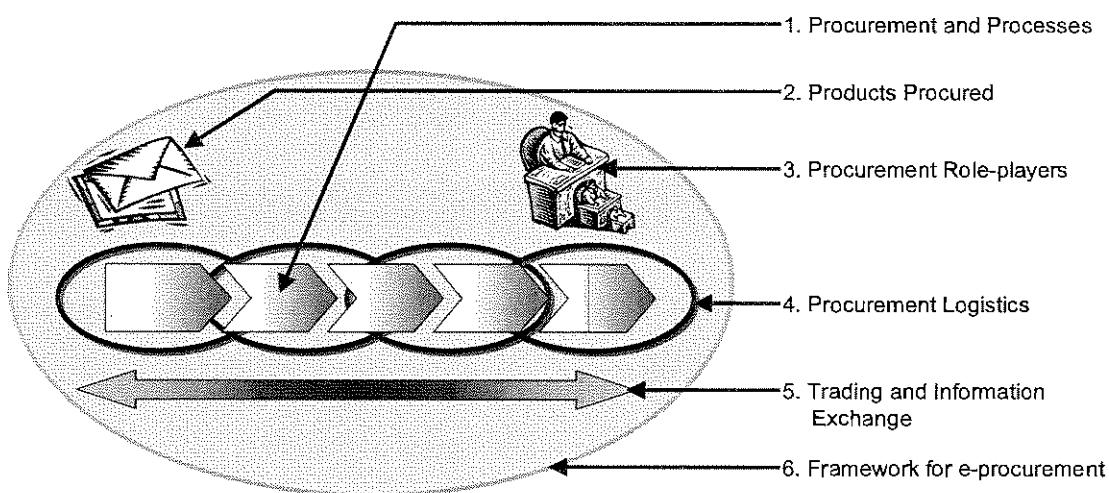


FIGURE 1: APPROACH TO FRAMEWORK DEVELOPMENT



The basis of procurement, and subsequently the research, is procurement logistics and processes (aspects 1 and 4 in the above figure). This enables the flow of products (aspect 2 above) from the source of supply to satisfaction of demand. Information (number 5 above) is exchanged between different role-players (aspect 3 above) not only to specify demand, but also to control the process and flow of products. All these aspects are addressed in constructing a framework to assist in choosing the correct products for e-procurement, as well as determining the architecture of the needed solution.

1.5. Work Plan

The structure of the research and this document is detailed below:

- **Chapter 2: Procurement and Procurement Processes.** The current procurement process is discussed. Any variations between the processes of procuring different product categories are analysed. The e-procurement process is explained, as well as the advantages of this process.
- **Chapter 3: Products Procured.** The typical items procured in the B2B procurement arena is discussed. Broad product categories are formulated and their characteristics defined. Given the characteristics, it is determined which product categories are suited for on-line buying and, if not, what limitations exist.
- **Chapter 4: Role-players in the Procurement Process.** The typical role players in the procurement process are analysed. Each role player's value in the traditional procurement process, as well as in an e-procurement model are discussed. The buyer-seller relationship in industry is determined. The suitability of e-procurement for certain industries is established and, if they are unable to participate, what are the reasons. It is determined if the role players in the original procurement arena still have value in an e-procurement process and what changes occurred to their value proposition.
- **Chapter 5: Procurement Logistics and Supply Chain Management.** The recent advancements in supply chain management as well as collaborative planning and forecasting is discussed. The impact of build-to-order, build-to-stock and assemble-to-order environments on the supply chain are evaluated. The relationship of procurement and aspects such as inventory, forecasting and ordering and receiving are analysed.



- **Chapter 6: Trading and Information Exchange.** The aspects an on-line solution should encompass are discussed. These include aspects such as the information exchange and data format, Information platform, Integration issues and security and on-line business models.
- **Chapter 7: e-Procurement decision-making and rollout at Sasol.** The e-procurement decision and implementation approach followed by Sasol is investigated. All of the aspects addressed throughout the document were investigated at Sasol. The final part of the chapter discusses the Funnel Model as developed by Sasol. This model is used to determine which products should be purchased through the system and also to prioritise roll-out within the different business units within the company.
- **Chapter 8: Framework for e-Procurement.** From all the aspects covered, an evaluation framework is built that will assist organisations in assessing their procurement environment and determining which of their products are suited for e-procurement. It also specifies the information architecture of the solution that is used as evaluation criteria to compare different e-procurement solutions.
- **Chapter 9: Conclusion.** The findings from all the previous chapters are summarised. The developed model is also compared to the Funnel Model used by Sasol to determine the advantages of each model. The chapter is concluded by suggesting further research to be undertaken in e-procurement and its implementation.



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CHAPTER 2

PROCUREMENT AND PROCUREMENT PROCESSES



2. PROCUREMENT AND PROCUREMENT PROCESSES

2.1. Chapter Introduction

According to Hugo *et al.* (2002:4) the objective of successful purchasing is to buy the right requirements (quality) in the right quantities at the right time at the right price from the right supplier and with delivery to the right place.

Chapter 2 aims to provide an understanding of procurement and its difference compared to purchasing. The main objective of purchasing, as well as its role within the functioning of a business will also receive attention. This chapter will also give an introduction to the different types of purchasing, focussing on the process, buying situations and purchasing dynamics. The influence of e-procurement will be discussed throughout the chapter. The chapter will be concluded with findings on the impact and suitability of e-procurement, focussing on the procurement process and dynamics surrounding it.

2.2. What is Procurement?

Whilst purchasing mainly describes the process of buying (learning of need, location and selecting a supplier, negotiating price and other pertinent terms and following up to ensure delivery), procurement is a somewhat broader term, including aspects such as stores management, traffic, incoming inspection and salvage (Hugo *et al.* 2002, 5-6). Laaper (1998:2) mentions that it spans from user to customer and visually explains its impact through Figure 2:

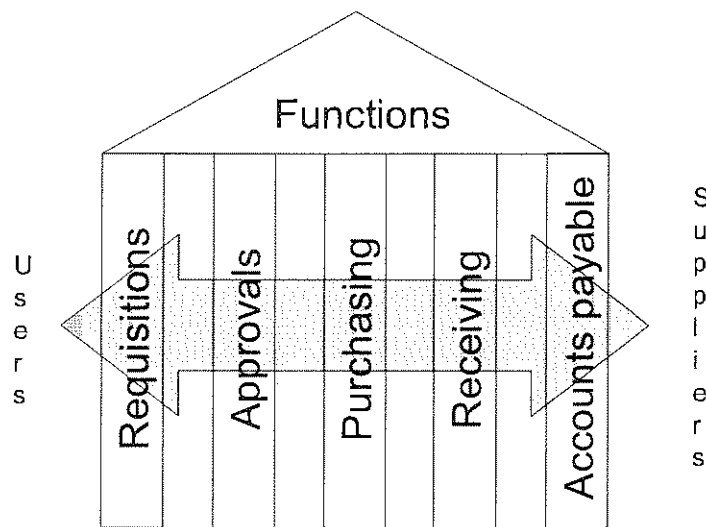


FIGURE 2: PROCUREMENT PROCESS FUNCTIONAL BREAKDOWN

Lambert & Stock (1992:485-487) adds that the terms purchasing and procurement are often used interchangeably although they differ in scope. Purchasing generally refers to the actual buying of materials and those activities associated with the buying process. Procurement is broader in scope and includes purchasing, traffic, warehousing and receiving materials. Procurement is therefore all actions necessary to close the complete purchasing cycle.

Procurement also combines strategic aspects (such as vendor and supplier management) as well as operational aspects (ordering products and following up deliveries). According to Banks *et al.* (1987:1-3), procurement has the following functions within the organisation:

- Provide an uninterrupted flow of materials, supplies, and services required to operate the organisation
- Keep inventory investment and loss at a minimum
- Maintain adequate quality standards
- Find or develop competent vendors
- Standardise, where possible, the items bought
- Purchase required items and services at the lowest ultimate cost
- Improve the organisation's competitive position
- Achieve harmonious, productive working relationships with other departments within the organisation
- Accomplish the purchasing objectives at the lowest possible level of administrative costs

Figure 3 visually explains the difference between buying (or purchasing), procurement and supply management (Robeson and Capacino, 1994:414)

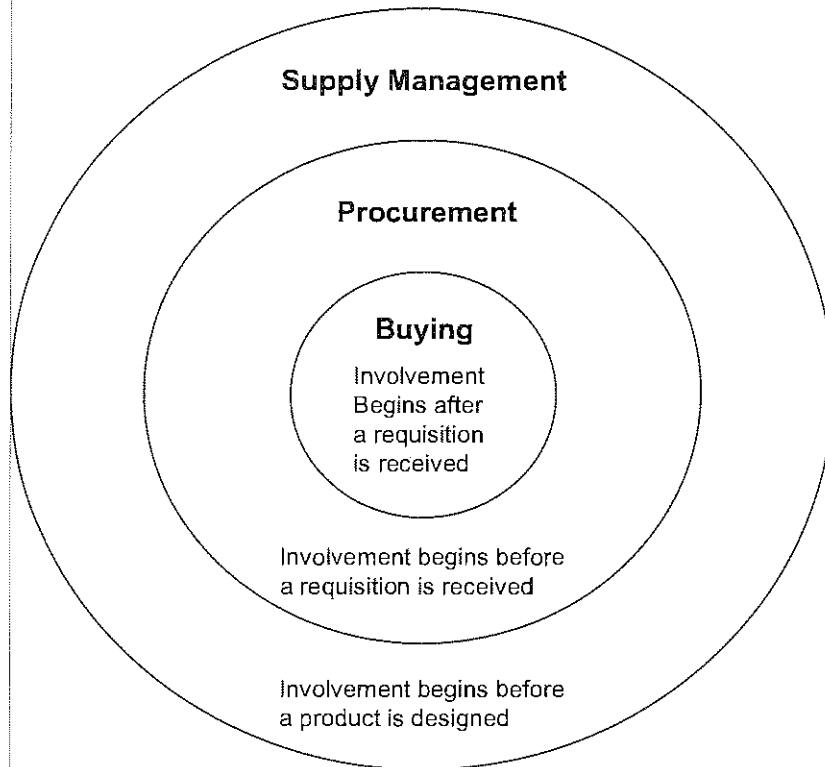


FIGURE 3: ASPECTS OF THE ACQUISITION PROCESS

Due to the fact that procurement is an all-encompassing function, an adequate e-procurement solution should encompass all bordering aspects to realise significant value. Table 1 indicates which of the discussed procurement actions are addressed by purchasing, procurement or e-procurement.

TABLE 1: ADDRESSING VARIOUS PROCUREMENT- AND BORDERING ACTIONS

	Purchasing actions	Procurement action	e-Procurement
<i>Provide uninterrupted material flow</i>			
<i>Vendor selection and management</i>			
<i>Procurement process improvement</i>			
<i>Maintain product quality</i>			
<i>Materials handling</i>			
<i>Standardising supply</i>			
<i>Improve company competitiveness</i>			



From the above table it is clear that procurement involves a substantial amount of additional aspects not addressed in purchasing. e-Procurement addresses the bulk of these actions, but especially the “supply chain component” of procurement is not specifically addressed by e-procurement. As it is important to understand where e-procurement fits into the total procuring process, aspects such as the “supply chain component” of procurement not addressed by e-procurement will be addressed in this document as well. e-Procurement functionality could also be extended through integration with other applications such as ERP (which will be addressed in Chapter 6), further emphasising the need for a totally integrated view on e-procurement.

2.3. Main Objectives of Procurement

Procurement acts to satisfy a need. The need can either be internal to the company (to be used by an employee), or external (to be sold to a customer). The main intention of procuring items for internal use is to enable internal operations. Paper for example is used within an organisation and is regarded as an expense, but is very necessary for company operations.

According to Banks *et al.* (1987:1-3), utility is the power to satisfy human wants or needs. Two general kinds of external utility may be considered:

- Utility of goods consumed by individuals or societies to satisfy individual or collective wants.
- Utility of an object may have as a means to an end, as is the case with producer goods and raw materials.

The organisation engaged in manufacturing transforms raw materials and purchased parts into an output product of increased utility. Utility is created by the alteration of the physical characteristics of the material flow by the use of capital, equipment, power, and human service. The organisation engaged in distribution imparts increased utility to goods through the use of transportation facilities, warehouses and human service. In the latter case, utility is created by the alteration of the location of the goods in question.

e-Procurement evolved to address the individual or collective wants within organisations. Chapter 3.3 will further discuss this, distinguishing between direct- and indirect purchasing. Therefore although the e-procurement is very much automated, it is still manually triggered.

2.4. Purchasing's Role in the Functioning of a Business

Purchasing is now increasingly recognised as a strategic activity that enhances profitability. Although purchasing occurs at the start of the traditional value chain, the effects of purchasing decisions can be magnified downstream within the organisation, ultimately impacting the viability of the end product or service provided to the customer. According to Thompson *et al.* (2000), other areas of the organisation indirectly affect purchasing process costs as well. They add that inventory Management and Just-In-Time tactics are also closely tied with Procurement Management.

According to Porter (1985:36) each firm is a collection of activities that are performed to design, produce, market, deliver and support its product. A firm's value chain and the way it performs individual activities are a reflection of its history, its strategy, its approach to implementing its strategy and the underlying economics of the activities themselves.

Porter's generic value chain depicted in Figure 4 consist of three primary things, namely:

- *Primary activities.* These activities are involved in the physical creation of the product and its sale and transfer to the buyer as well as after sale assistance.
- *Support activities.* These activities support the primary activities and each other by providing purchasing inputs, technology, human resources and various firm wide functions.
- *Margin.* Margin is the difference between total value and the collective cost of performing the value activities.

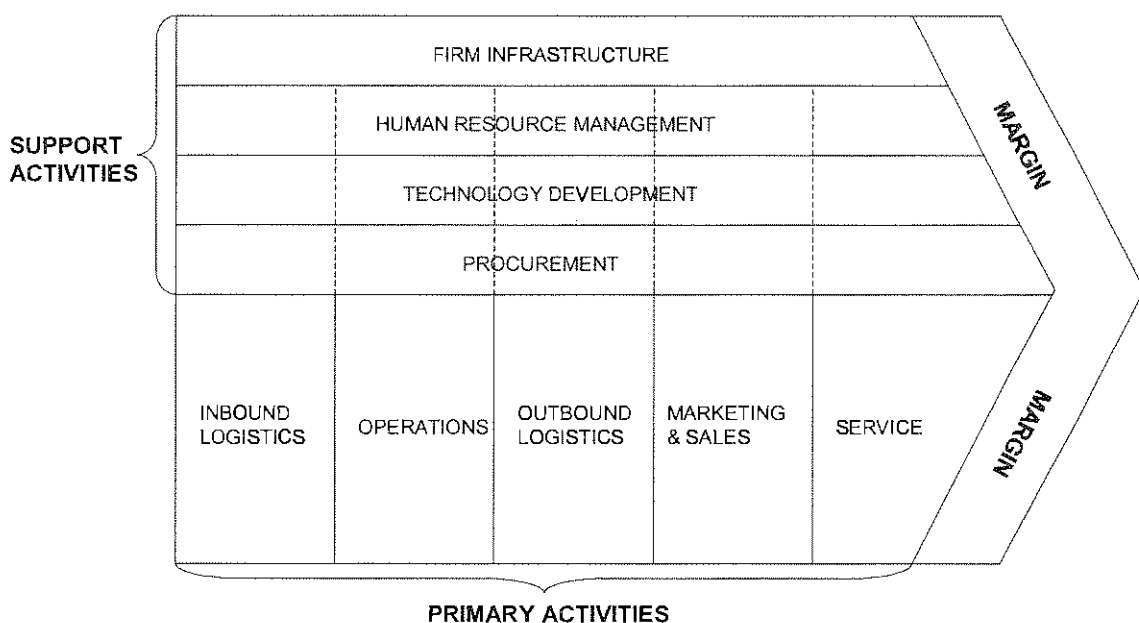


FIGURE 4: GENERIC VALUE CHAIN



From the above it is clear that purchasing is involved not only as a support activity, but also as a primary activity in inbound logistics. According to Porter (1985:39) inbound logistics are all activities associated with receiving, storage and dissemination inputs to the product, such as materials handling, warehousing, inventory control, vehicle scheduling and returns to suppliers. Procurement from the generic value chain refers more to the function of purchasing inputs as opposed to the purchased inputs themselves. As this function can occur anywhere within the firm and includes not only raw materials, it is set out as a support activity. Porter (1985:47) mentions the following items to be purchased in the firms:

- *Inbound logistics*: Transportation services.
- *Operations*: Materials, Energy, Electronic parts and supplies.
- *Outbound Logistics*: Computer- and transportation services.
- *Marketing & Sales*: Media Agency Services, Supplies and Travel & Subsistence.
- *Service*: Spare parts and Travel & Subsistence.

Porter (1985:41) does however state that purchasing practises can strongly affect the cost and quality of purchased inputs and therefore needs focus in the drive towards becoming more competitive.

The organisation type will largely determine the significance of procurement spent. In especially manufacturing organisations purchasing has a huge impact on its bottom line. According to Hough and Ashley (1992:1) a typical company makes a profit of 5% to 20% on every dollar sold. Savings made by purchasing impact profit directly. In other words, 5 to 20 cents will be earned for an extra dollar sold, but \$1 will be earned for every dollar saved by purchasing.

Elliff (2001) adds that purchases in manufacturing companies represent 50% to 90% of the company's cost structure, making procurement strategy and execution a critical lever for effective supply chain operations and superior business profitability. He adds that one percent improvement in the overall cost of purchased materials and services can increase a company's bottom line by 10-20% or more- a dramatic impact on profitability and shareholder value.



Non-manufacturing related procurement has far less impact on company profitability. That does, however, not mean that there are not large savings to be made in these organisations. The average size of a purchase order in non-manufacturing companies is much smaller than their manufacturing peers. Also numerous people are involved in the purchasing process in non-manufacturing companies due to the companies not seeing procurement as that much of a strategic operation (especially in the services industry). This makes for very high cost to procurement (cost of the purchasing process in the company compared to the value of the item procured). Reducing the cost per order will therefore make smaller order quantities more viable, having the effect of reduced inventory holding cost and will reduce over-purchasing due to uncertain demands.

Laaper (1998:3) mentions the following unnecessary costs associated with the procurement process:

- Maintaining a larger than needed supplier base.
- Obtaining larger than needed volumes.
- Lack of standardisation.
- The cost of extended lead times and cycle times.
- The cost of order processing & receiving.

To understand the impact of increasing company profitability, it must be understood that organisations are subject to change in their environments. Due to increased competition and growth in profitability, companies have to alter their efficiency and effectiveness. According to Sink & Das (1986), efficiency is “the degree to which a system utilises its resources in correctly performing its function (doing things right). It is the operational focus of productivity management”. According to them effectiveness on the other hand is “the degree to which a system accomplishes what it is set out to accomplish (doing the right things). It is the strategic focus of productivity management”. Clearly from this, improving a company’s procurement operations will increase its efficiency. In the profitability race all companies undertake, procurement is a good focus area as small savings can have huge financial impacts. Also improving lead times and order cycle times can have a significant improvement on customer service levels.

According to Thompson *et al.* (2000) one of the predominant reasons companies venture with e-procurement is for the possibilities to save costs. Chapter 2.6 specifically focuses on the process improvements e-procurement offers through automating previously manual processes. Table 2 summarises how e-procurement aims to reduce the costs associated with procurement.



TABLE 2: REDUCING PROCUREMENT COSTS THROUGH E-PROCUREMENT

Associated procurement costs	Solution of e-procurement
<i>Maintaining a larger than needed supplier base.</i>	With the bulk of e-procurement based on catalogue spending, companies can control from which companies are purchased. This has a follow-on effect of a reduced supplier base.
<i>Obtaining larger than needed volumes</i>	e-Procurement contributes to companies better controlling their purchasing. Through data analysis companies can reduce spending per product type.
<i>Lack of standardisation</i>	Each product type follows a standardised process in e-procurement, through approval to requisitioning
<i>The cost of extended lead times and cycle times.</i>	Longer than necessary lead time results in carrying unnecessary target stock. e-Procurement provides a vehicle to track fulfilment more effectively, providing MIS for improved supplier management.
<i>The cost of order processing & receiving.</i>	e-Procurement reduces order processing. Costs associated with receiving can be reduced if the system is integrated with the correct back-end system to ensure a 3-way check.

Although e-procurement automates some actions within the procurement process, it also provides tools for the measuring and management of procurement in broader terms within organisations.

2.5. Buying Situations

The buying situation, or the situation the buyer is in at time of purchase determines the complexity of the choice at hand. Lambert & Stock (1992:488-490) distinguish buying situations into two categories: i) Routine orders and ii) Non-routine orders. They further distinguish between three different types of buying situations on the basis of the familiarity of the participants in the buying process with the product or process they consider, namely:

- A 'new task', which is one which the participants have not dealt with before.
- A 'straight re-buy' that represents purchases of known products from previously used and accepted suppliers.
- A 'modified re-buy' that is an intermediate category having some characteristics of new tasks and many of straight re-buys.



These three classes will vary in complexity. The 'new re-buy' will be the least complex, while the 'straight re-buy' the most complex. From Parkinson and Baker's classification, it is clear that the supplier dealt with (number of suppliers supplying the product) and the product bought (type of product and frequency of purchase) will be the predominant indicators of complexity.

Lehmann and O'Shaughnessy (1974:36-42) add that complexity mainly focuses on the type of product purchased. The frequency of buying the product, the complexity of its specifications and the complexity of its environment are the main aspects impacting the complexity of the purchase.

They distinguished between four types of buying situations:

- Those associated with *routine order products* where there were no problems in use. The main choice criteria are reliability in delivery, price and an ability to be flexible in meeting varying levels of demand.
- *Procedural problem products* are defined as products where the performance of the products is predictable but the organisation has to make some changes to adjust to buying it. Such products frequently require some form of retraining of staff and technical services from the supplier were often seen as major determinants of choice
- *Performance problem products* are those products where there are doubts as to the performance of the products in terms of the customer's requirements. For such products the key performance characteristics are identified as reliability of delivery, flexibility of the supplier in dealing with the customer's specific problems and technical service
- *Political problem products* are identified as those involving large capital outlays, or where the product might be an input into several different departments. Such purchases may involve a considerable amount of departmental liaison and potential conflict. For these products price, supplier reputation and information on the reliability of the product in operation were identified as the main factors in choice

The abovementioned research, however, focus only on certain parts of the total picture. To conclude, the complexity of the buying situation largely depends on the following:

- *Product purchased*. This includes the type of product, its requirement, its importance and the degree of complexity
- *Suppliers*. This includes the number of possible suppliers to choose from and their relationship with the buyer.
- *Market*. Aspects such as buyers/seller cartels and monopolies could very well influence the complexity of the buying decision.

Each buying situation is unique and encompasses various degrees of the abovementioned factors. These factors shown in Table 3, can individually contribute to complexity.



TABLE 3: ASPECTS CONTRIBUTING TO PURCHASE COMPLEXITY

		Very complex	Medium complexity	No complexity
Product	<i>Characteristics</i>	Commodity type- little brand sensitivity	Definite product classification	Distinct product classification and branding
	<i>Item price</i>	Expensive	Medium expensive	Inexpensive
	<i>Frequency of purchase</i>	Never been purchased before	Has been purchased before, but infrequently	Purchased frequently
Suppliers	<i>Number of possible suppliers</i>	Numerous	Substantial amount	Few
	<i>Relationship with buyer</i>	No relationship	No/existing relationship; not very good relationship	Existing relationship with good understanding
Market	<i>Market governance</i>	Very governed	Little to no governance	No governance- free market

e-Procurement solutions will have value for each of the three abovementioned type of complexities. The more complex the situation becomes, the more purchases will be negotiated on a per product basis. In these cases purchases will probably not be made through a catalogue solution, but rather an auction or “post and browse” solution (refer Paragraph 6.5.5 on page 173). Less complex buying situations will require less negotiation and products will be leveraged from an existing relationship.

2.6. The Procurement Process

2.6.1. The traditional procurement process

The acquiring process is very much product dependent and will vary depending on the item purchased. Generically the purchasing cycle consists of a series of consecutive purchasing activities to be performed for each purchasing transaction. Hugo *et al.* (2002:17-24) and Thompson *et al.* (2000) have put down the following 10 generic steps:



1. *Development/recognition of the need.* This starts with the need for specific materials, parts or service that originates at the user of the goods or in the stores department that stocks these requirements as part of inventory.
2. *Description of the need.* The detailed requirements of user departments are communicated to the purchasing department by means of a purchase requisition (used for requirements such as office equipment, stationery and protective clothing), travelling requisitions (used by the stores department for repeated purchasing of standard inventory requirements) or materials list (materials requirements related to a particular production run or product group).
3. *Selection of sources of supply.* This involves determining available suppliers, choosing the correct one according to set criteria and formalising contractual detail where applicable.
4. *Determination of prices and availability.* To a large extent this occurs simultaneously with the selection of the supplier. Availability of standard products can be determined by using price lists, catalogues and written quotations. For specialised products or custom made equipment needed for increasing existing production capacity, availability is more often the conclusive factor, preceding decisions related to supplier selection and price.
5. *Formal request for product.* The user/purchaser herewith signifies what product he/she wants from which supplier as well as what quantity thereof.
6. *Requisition approval.* Depending on the purchase price or the user/purchaser's authority, the purchase firstly has to be approved by management. This serves as a control measure to limit purchasing expense.
7. *Processing and issuing the order.* This is normally done by the purchasing department and includes the aggregation of similar orders to the supplier. The original document is sent to the supplier and copies to the financial department (for payment of the invoice), receiving department (for inspection of material at arrival), the inspection department (for a detailed inspection of the delivery) and the purchasing department (for follow up and control measures).
8. *Receipt of request by vendor.* The supplier receives the purchase order and processes the order.



9. *Following up and expediting.* This involves reminding suppliers on a routine basis when the delivery can be expected.
10. *Dispatch of the item by the vendor through distribution channels.* The supplier dispatches the order either via an own distribution operation or an outsourced operation for delivery at the purchasing company.
11. *Receipt and inspection.* The receiving department is solely responsible for receiving all deliveries from suppliers and inspects all shipments to ensure that no damage to the shipment has occurred (containers and package) and that the number of parcels corresponds with the order and delivery note.
12. *Processing, discrepancies and rejections.* The purchasing department should undertake all negotiations with suppliers over unsatisfactory materials and the rejection of faulty shipments.
13. *Analysis of the invoice.* The purchase order, delivery note and invoice are compared with each other (called the 3-way check) to ensure the order was fulfilled correctly and payment is done on that basis. The most important aspects covered are price, calculations made, discounts, quantities and general conditions.
14. *Closing the order.* All related documents (a copy of the order, invoice, receiving note and quotations) are combined and submitted to the financial department for final payment. These records should be filed by the finance department for future reference and auditing purposes.

It is clear that this process involves numerous steps involving many people with different roles and responsibilities. If carried out on a large scale purchasing processes easily become cumbersome, wasting valuable time and obliging personnel to carry out a constant fire-fighting approach to keep track of the paperwork generated at each stage.

Especially the internal escalation of the order is frequently bypassed in companies by an informal approach in the hallway, telephone call or e-mail and complicates the purchasing function. (Hough & Ashley, 1992:57).



To ensure a valid comparison between different suppliers in the evaluation process, Hugo *et al.* (2002:144) suggest the use of a request for quotation (RFQ). The frequency of repeating the RFQ process is dependent on how frequently the specific product is ordered: If the product is ordered frequently the process might only be repeated annually as the buyer has a good indication who to buy from. Hough & Ashley (1992:72) adds that RFQs are sent out at two different intervals:

- To find the most competitive and qualified sources for new products.
- To determine if the existing supplier is still the most competitive source in the marketplace.

When the quotes from various suppliers are compared, certain criteria should be used as a basis for the criteria. These criteria will be very much product dependent but should include aspects such as warranty offered, delivery cost and additional setup charges and supplier reputation and capabilities. (Hough & Ashley, 1992:81)

2.6.2. Improvement in the procurement process

According to Lambert and Stock (1992:515-518) an 8-day order cycle is not unusual for companies that do not have automated order entry and processing systems. Variance in the duration of each step results in an ordering process ranging from five to 21 days with a modus of 13 days. This is costly to the buyer, as the company has to carry safety stock to cover for possible delays or lost sales as a result of stock outs.

Reducing the variance of the ordering process will pose as much value as that of shortening the average process duration. Reducing the variability in the order predictability will result in a smaller economic order quantity (EOQ) because less “buffer stock” has to be ordered for unknown delays.

To reduce the variability of the order cycle time, the whole order cycle should be focussed on. Previous attempts to improve ordering cycles of organisations added very little value due to being too internally focussed. Eliminating time within company boundaries may be difficult and costly, whilst a change in the method of order placement and order entry may have the potential for the most significant reduction in order cycle time.



2.6.3. e-Procurement process

According to Thompson *et al.* (2000) the procurement process is significantly improved using an e-procurement solution. According to them the ideal e-procurement system would function as follows:

1. Official recognition of the perceived need for an item.
2. Item is chosen from stock offered by trading partners, or selected from an on-line catalogue that automatically generates a formal request for authorisation.
3. Authorisation leads to a Purchase Order being generated and dispatched through a preferred communications channel, such as the Internet or a Virtual Private Network (VPN)
4. Receipt of request by the item's vendor.
5. Dispatch of the item by the vendor through normal distribution channels.
6. Receipt and checking of the item by the purchaser results in automatic payment for goods received.

This process reduces the previous 14 steps to only 6 steps. This reduces personnel time, paper, telephone, etc. costs. Inefficient and lengthy processes frequently hamper especially low value products. According to McLeod (2001) the average cost of stationery orders at First Rand Bank reduced from R210- (sometimes larger than the total order value) to R50 per order. Of the initial R210 cost per order only about R15 refers to consumable and telephone expenses. The rest of the value is due to employee related costs (salaries, infrastructure, etc.) A large amount of this cost saving is based on the time of employees saved that can be used for other value adding activities within organisations. A large proportion of the claimed savings are therefore not "bottom-line" savings to the company. Curtiss (2000) refer to the ENID™ factor stating that most organisations have a little old lady in stores, accounts or admin called "Enid", and unless she is removed from the organisation, overall costs cannot be reduced.

Companies wishing to pay-off e-procurement solutions purely based on process savings may soon discover that the investment is not viable. The feasibility should include factors such as the ability to leverage additional purchase savings through controlled spending, reducing item prices through increased spent with vendors (when making use of marketplaces), etc. Also intangible benefits such as strategically aligning with best of breed business practices could influence the decision.



2.7. Purchasing Dynamics

Procurement functions differently within various businesses. Aspects such as authorisation, budget for spending and suppliers from who can be purchased can either reside at a centralised (all purchasing is controlled by head office) or at a decentralised level. Forward buying and blanket orders are also addressed in order to establish the total functioning of dynamics within purchasing.

2.7.1. Centralised and decentralised purchasing

In larger companies with distributed offices/sites purchasing authority becomes an important aspect. Authority either resides centrally (requisitions is approved at “head office”) or decentrally (each company site has the authority to approve or reject its own requisitions). According to Gadde & Håkansson (1993:27) authority is affected by the organisational structure a company chooses. A central purchasing unit makes it easier to specialise in relation to different supplier markets. On the other hand, a central purchasing unit makes it more difficult to keep in touch with the divisions using products. In a highly decentralised firm, it is easy to keep up internal contracts within each of the local units and also to stay in close contact with suppliers used frequently. It is also more difficult to co-ordinated between the different units belonging to the same firm and to have a clear external overview.

Table 4 discusses the advantages and disadvantages of centralised- and decentralised purchasing (Gadde & Håkansson, 1993:28-30; Hough & Ashley, 1992:21-22).



TABLE 4: COMPARISON OF CENTRALISED AND DECENTRALISED BUYING

	Centralised purchasing	Decentralised purchasing
<i>Specialisation</i>	Market- and product specialisation more economical	Reduced professionalism of the purchaser- he/ she is a far greater generalist
<i>Internal communication</i>	Difficult to keep in touch with all divisions effectively- sense of us vs. them can easily arise	Purchasing is closely associated with the total operation of the company/ unit which it is part of
<i>Resource utilisation</i>	Little duplication of work and better resource utilisation (manpower, paper, etc.)	Duplication of work exists, as each distributed member does similar function
<i>External communication</i>	Co-ordination among different parts of the firm in relation to individual suppliers	Facilitates co-operation with the local suppliers
<i>Local influence</i>	Procedures are formal and centralised buyers are not easily influenced by local suppliers	Employees and suppliers influence buying decisions without proper regard to cost
<i>Item cost</i>	Aggregated purchasing resulting in lower item prices and larger negotiation power	Reduced negotiating power with national suppliers- usually local suppliers are more expensive per item
<i>Distribution cost</i>	Courier cost to decentralised sites can make a purchase very uneconomical	Reduced courier cost due to short distances of delivery
<i>Inventories</i>	Lower inventories and smaller safety stock	Fragmented inventories, resulting in more safety stock
<i>Lead time</i>	Longer lead times as orders are aggregated centrally	Quick response time- quicker to place an order and ask for delivery
<i>Control</i>	<ul style="list-style-type: none"> ◦ No local bias- central buyer not influenced by local buyer ◦ Difficult to ensure "3-way check" 	<ul style="list-style-type: none"> ◦ Control is localised ◦ Difficult to establish a good co-ordination with other units in the firm

It is clear from Table 4 that there are advantages to both buying centralised and decentralised. Centralisation or decentralisation is product bound and companies may have some products that are purchased centrally and others that are purchased decentralised.



According to Hough & Ashley (1992:22) a modified system needs to be designed to enable the realisation of the most benefits in centralised/decentralised procurement. This can take on several forms- decide what is the greatest annual spend, centralise it and have the lower spend decentralised. In a manufacturing environment the production goods will be the higher spend, whilst the lower spend will be MRO (maintenance repairs and operations). The responsibility for purchase of capital equipment is often shared. MRO could however accumulate to great expenditure depending on the nature of the business- in this case a far lower cost will be obtained centralised than decentralised. The following aspects should be used to determine a product's tendency to purchased central/decentralised:

- ❑ What is the item cost of the product?
- ❑ What is the company's total annual spending on the product category?
- ❑ Where are the current suppliers situated and what is their price per item?
- ❑ What will be the impact on the supplier should he/she not be supplying a product in future?
What will be the impact on the item price of other products purchased from the supplier?
- ❑ What will be the impact on delivery cost should the product be supplied centrally/decentralised?
- ❑ What are the total worth of safety stock and inventory throughout the company?
- ❑ What is the current lead-time for order delivery and what will be the impact should the purchasing of these product be centralised/decentralised?

e-Procurement will benefit both centralising and decentralising purchases. Through automated workflow purchases can initiate at a decentralised level and be escalated centrally for final approval. Should companies consider buying decentralised, the process can still be automated and smaller suppliers can obtain the requisitions via the Internet. Similarly to all e-procurement aspects, a company-wide policy should exist stating which of the two is acceptable. The policy should focus on an integrated view point, taking into consideration the cost of delivery, the improved pricing though aggregating purchases, delivery lead time and ability to control purchasing for both options.

2.7.2. Forward buying

Forward buying is the norm of purchasing for most companies. This implies that materials, component parts and subassemblies are available ahead of the time they are needed. Therefore it can be stated that all purchases, except emergency purchases, represent forward buying.



According to Lambert & Stock (1992:495) forward buying refers to the purchase of materials in quantities exceeding current requirements, well in advance of their need or use. Companies engage in forward buying for the following reasons:

- It minimises the effect of rising material costs. Until the materials are depleted from inventory, the firm is protected from price increases in the marketplace.
- It provides protection against future availability problems.

From the above it is clear that forward buying is most popular among firms where availability uncertainties are commonplace.

Forward buying however also has the following disadvantages:

- Companies make forward purchases in anticipation of price increases. There are however times when prices go down. There is thus a risk that the company can purchase materials at prices higher than necessary.
- Inventory carrying costs incurred with holding excess inventory. The savings accrued from forward buying must therefore exceed the additional inventory carrying cost.

The choice of forward buying should be incorporated with the total materials handling cost that includes cost to purchase, item price, inventory holding cost as well as aspects such as price forecasting.

Although e-procurement is an automated purchasing activity, the quantity and timing of forward buying will still be manual. The purchasing department within companies should be in frequent contact with suppliers (to know of anticipated price increases) as well as with internal departments (to understand variability in demand as well as anticipated design changes). With this knowledge at hand purchasing departments can buy excess stock of certain products. The excess stock can serve to fulfil future requisitions from individual departments.



2.7.3. *Blanket orders*

All companies (especially manufacturing companies) have low-value items they purchase from suppliers. The process to purchase these items is just as costly as that of other items, making for an extremely high cost relative to purchase. According to Lambert & Stock (1992:507-508) blanket orders (or system contracts) were developed to overcome this burden and are arranged for a given volume of purchases over a specified time period. An agreed-to quantity is not legally binding, but gives sufficient assurance for the vendor to seek volume purchases from its sources. These volume purchases help reduce the final cost to the buyer.

The main objectives of the system contract are:

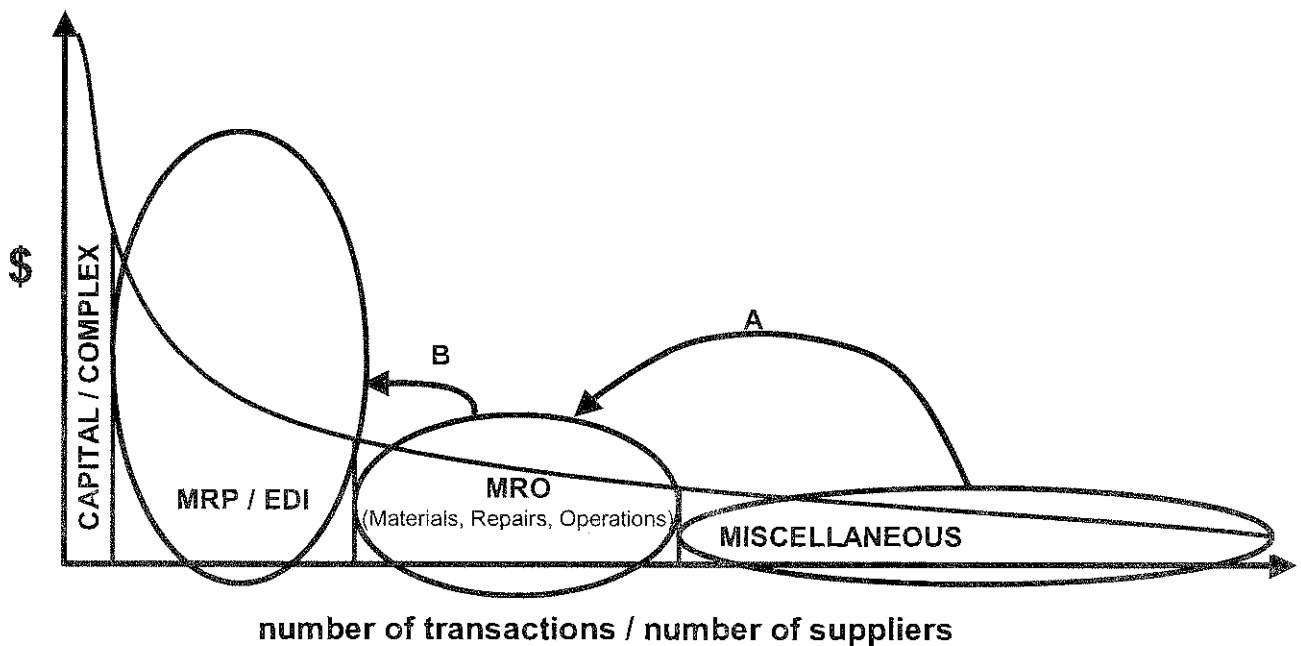
- ❑ Lower inventory levels
- ❑ Reduce the number of suppliers
- ❑ Reduce administrative costs and paperwork
- ❑ Reduce the number of purchases of small value and requisitions that purchasers have to handle (and thereby increase the amount of time available for other key activities)
- ❑ Provide the opportunity for larger spend volumes of business suppliers
- ❑ Provide for timely delivery of material directly to the user
- ❑ Standardised purchase items where possible
- ❑ The price is fixed over the period of the contract

An e-procurement system will have limited value to the blanket order process, except for a 3-way tie (comparing purchase order, to delivery note, to invoice received) to add control to purchasing in this area.

2.8. Chapter Conclusion

From the chapter it is clear that e-procurement does not address procurement in its totality, but predominantly aims to streamline and control purchasing processes. e-Procurement aims to minimise the total cost of ownership of the purchasing action by involving less personnel and improving control over purchasing. The largest scope for improvement lies in purchasing for consumption (or internal use) and explains why this was the first area targeted by e-procurement.

Consumption-based e-procurement is however triggered through manual intervention (someone has to place the order; the order is not triggered by a system). Orlov *et al.* (2000) mention that this process still wastes time and should be automated even further. The current e-procurement process evolved from indirect procurement, which is based on consumption (or internal demand) and not external demand. It therefore requires a large amount of manual intervention. Figure 5 indicates the control e-procurement has brought about (Shift A), while a further shift in control is required (Shift B) for “hands-free” procurement. (Adapted from Curtiss, 2000)



	Capital/ Complex	MRP/EDI	MRO	Miscellaneous
# transactions	Small	Large	Large	Huge
# suppliers	Small	Large	Large	Huge
Purchasing Characteristics	<ul style="list-style-type: none"> High value, once off Complex and hands-on 	<ul style="list-style-type: none"> Product and retail based purchases JIT and Kanban 	<ul style="list-style-type: none"> Consumption based Contract pricing 	<ul style="list-style-type: none"> Unplanned, emergency or "maverick" purchases Uncontrolled pricing
Order processing	Manual	Automated	Manual	Manual

FIGURE 5: E-PROCUREMENT FOCUS

e-Procurement systems currently aim to control the uncontrolled maverick purchases through increased contract usage and purchasing leverage with suppliers (shown as shift A in Figure 5). e-Procurement system should strive to use the contracted prices and make use of machine initiated transactions (shown as Shift B in Figure 5).



CHAPTER 3

CLASSIFICATION OF PRODUCTS PROCURED



3. CLASSIFICATION OF PRODUCTS PROCURED

3.1. Chapter Introduction

All institutions, whether private, government or community institutions require goods such as raw and other materials, machinery and equipment as well as services such as installation, repair, maintenance, transport and others in order to execute their activities. According to Thompson *et al.* (2000) business is fundamentally the buying and selling of goods and services. Purchasing is therefore an inherent function of every organisation.

Manufacturing firms buy goods and services to use in their production processes. This includes the necessary materials, machines and equipment. Similarly commercial firms require goods and services for re-selling. A retailer obviously cannot trade without the assurance that the necessary merchandise is or will be available. Service firms such as banks, hotels and transport firms must also buy goods and services in order to practise their business activities

Chapter 3 serves to discuss all aspects regarding products procured, the need they fulfil, their importance in certain industries as well as all differences relating to the products. The chapter will conclude with the identification of products that are suited for acquisition with an e-procurement system.

3.2. Strategic Product Decisions

3.2.1. Price determination

Transactions between buyers and seller are based on the fact that both parties see benefit in the trading agreement. The most critical aspect to this benefit realisation is that the price set has to be fair for both parties. According to Hugo *et al.* (2002:113) a fair price is the lowest price that ensures a continuous supply of the proper quality where and when needed. To be fair, this price should incorporate the total manufacturing cost, economic factors of supply and demand including the total cost of goods and services at the point of consumption.



According to Hugo *et al.* (2002:113-115) prices are determined through three main aspects:

- *The prevailing market price.* This is the price the bulk of bulk buyers will pay for items, given that no further negotiation takes place. Should a company have a significantly high spend of a specific item or category, this category is not recommended.
- *Competition in the market.* Usually in markets with high liquidity (much buying and selling taking place) this category is recommended, as the lowest purchasing price will easily surface.
- *Prices are negotiated.* Companies with authority in the market place (due to its high procurement spend or influence in the market) usually prefer this category. Also should products and services provided be extremely specialised (once-off), the purchasing price also tend to be negotiated.

Nishimura (1992:6-7) adds the following ways:

- *Double auction.* In this case both buyers and sellers can negotiate prices with each other.
- *Posted offer.* Here sellers determine their prices and buyers are allowed only to decide whether or not to buy from them.
- *Take-it-or-leave-it.* Trade is organised by the posted offer, not by the double action.

The auction process involves bidding by possible suppliers. In some highly regulated organisations such as governments, bidding has to be used as a vehicle to choose the least expensive party given certain criteria. According to Leenders & Fearon (1993:309,313) the following conditions are necessary for the bid process to work efficiently:

- There must be at least two, and preferably several qualified suppliers.
- The suppliers must want the business.
- The specifications must be clear, so that each bidder knows precisely what is being bid on and so the buyer can easily compare the quotes received from various bidders.
- There must be honest bidding and the absence of any collusion between bidders.

The optimum number of bidders are very much dependent on the buyer, given that at least two bidders respond. A multiplicity of bidder does not ensure a truly competitive price, although under ordinary circumstances it is an important factor, provided that the bidders are comparable in every major respect and provided that each is sufficiently reliable so that the buyer would be willing to purchase from that supplier.

The lowest bid may not always be the most advantageous, as it could be that the firm submitting the bid is not reliable or that the lowest bid is higher than the buyer believes justifiable for the situation. Also certain divisions may prefer certain manufacturers' product. (Leenders & Fearon, 1993:311) Competitive bidding works best in a buyer's market. Should any of the above conditions be absent- that is sole sourcing, a seller's market, specifications not complete or subject to varying interpretations or suspect supplier collusion- negotiations is the preferred method of price determination. According to Leenders & Fearon (1993:314) negotiations is the most expensive process of price determination and requires both buyer and supplier to through discussion arrive at a common understanding on the essentials of a purchase/sale contract.

One of the e-procurement marketplace business models is that of auctioning.

Figure 6 shows the different auction types, with price direction, characteristics as well as on-line examples of each. (Kafka *et al.*, 2000:b).

Type	Price direction	Characteristics	Examples
Dutch auction	↓ falls	Price declines at set times and set decrements until a buyer accepts the price	DoveBid, Liquidation.com
English auction	↑ rises	Bids are visible to all. Auction ends when no new higher bid is made	XSAg.com
Japanese auction	↑ rises	Price rises at set increments and participants drop out until only winning bidder remains	Ukiyo-e World
Sealed-bid, first-price auction	↑ rises	Bids are submitted, visible only to auction-maker. Highest bidder wins and pays highest bid price	redtagoutlet.com
Sealed-bid, second-price auction	↑ rises	Bids are submitted, visible only to auction-maker. Highest bidder wins and pays second-highest bid price	BizAuct.com
Reverse auction	↓ falls	Buyer-driven auction that can take on many of the above characteristics	FreeMarkets, MaterialNet.com

FIGURE 6: ON-LINE BIDDING OPTIONS



Companies wishing to use on-line bidding as a negotiation tool can do so by choosing to bid either on contracts or individual products. The choice of using auctioning is based on the following criteria:

- The buying situation at hand. (A new task, straight re-buy or modified re-buy.)
- The nature of the product (homogenous or differentiate).
- The competition in the marketplace (monopolistic, oligopolistic, etc.)
- The availability of the goods or services.

These factors are summarised in Table 3 on page 17 into three types of buying complexities. For more complex situations (especially high cost items), auctioning will be a very viable option. For lesser complex situations (especially lower cost items), auctioning will probably add little value. Should the supplier of choice be a straight forward decision, auctioning can be used for contract negotiation.

3.2.2. Acquiring decisions in companies

According to Hough & Ashley (1992:116), the buyer needs to make one of the following choices in fulfilling its needs:

- Make versus buy
- Repair versus replace
- New versus used
- Lease versus purchase

a. Make/buy decision

The degree of vertical integration (the degree to which the company covers the entire range of production stages) preferable for a company has been a question since early procurement days. According to Martin (1995:305) large enterprises in the 1960s and 1970s sought total vertical integration. Company executives tried to reduce all expenditure, extending the chain of manufacture so that larger savings accrued.

Companies with a high vertical integration are however more inflexible. These companies tend to sell what they are able to manufacture, not manufacturing what they can sell! The need for business flexibility has urged corporations to rather have close partnerships with corporations with the intricate integration that today's electronic makes possible, than owning and controlling all the corporations in the food chain.

Table 5 compares the advantages for manufacturing in-house and purchasing externally. (Gadde and Håkansson, 1993:36-40, Hugo *et al.*, 2002:138-140, Hough & Ashley, 1992:118-120)

TABLE 5: MAKE/ BUY ADVANTAGES COMPARISON

Manufacture in-house	Buy externally
Provides security when manufacturing techniques are kept secret	Companies are nimble as little investment is made in production equipment
Excess capacity can be used if items are found to be less expensive than purchased	Existing capacities can be used for something more economical
Should the purchased goods fit closely to other production, the necessary skill and equipment could already be on board	Companies are able to focus on their core business and buy what is needed additionally
Long and lasting demand could be service should the option pose less expensive than purchasing	Independent suppliers can produce to service demand stochasticity

An important aspect in the make/buy comparison is the costs involved. Should in-house manufacturing be preferred, the return on investment and payback period should be thoroughly calculated. The following costs should be incorporated for in-house manufacturing:

- Delivered raw material costs
- Direct labour costs including inspection cost
- Incremental manufacturing overhead cost
- Incremental managerial costs
- Incremental purchasing costs
- Incremental inventory carrying costs (interest, space, risk)
- Incremental financing costs

For buying that costs are:

- The purchase price of an item
- Transportation cost
- Receiving and inspections costs

Whilst all indications are that companies are moving towards lower vertical integration, focussing more on core business, there is some merit to in-house manufacturing. Kumpe and Bolwijn (1988:78) reason that companies in the final stages of the chain of refinement (assembly and distribution) make more profit whilst those at the beginning of the flow chain (development and component production) are in great need of investment in order for the competitive power of the whole chain to be maintained. In the short term, end-assembly firms may maximise revenues by decreasing vertical integration, but the long-term effects of this may be catastrophic. A company which chooses this strategy, may run its own strategic component suppliers out of business, and then find itself forced to purchase components from a competitor.

This reasoning is however not completely correct. Only in markets where few suppliers exist with high competitiveness the described effect may occur. Where sufficient number of suppliers and substitute products exist, the above-mentioned may never happen.

At the end the decision is purely based on the situation at hand. As a norm purchasing is preferred to in-house manufacturing. With the high emphasis on globalisation and the Internet bringing different parts of the world closely together, very few manufacturers will be without suppliers to choose from. Also, very few organisations will have a competitive edge stored in manufacturing secrets- current focus is rather on rapid improvement. Therefore in-house manufacturing will only be opted in extreme cases- the bulk of goods necessary for the company's operations should be purchased.

b. Repair/replace decision

Equipment (especially of capital nature) rendering services within the company need to be repaired and maintained from time to time. The decision should be based on whether there is no additional benefit in repairing the item rather than to replace it with a new one. According to Hough & Ashley (1992:117-118) the decision should be based on the following needs:

- *Cost.* A detail cash flow should indicate which is the preferred alternative. This should be done taking cognisance of the availability of funds, cost of capital layout, anticipated difference in cost of maintenance and expected service life, duration of product need, depreciation cost of both items and salvage value of the current item.
- *Technological advantage.* Especially products that have short technological life cycles are prone to be replaced by successors. The benefits of the new equipment should be quantified to determine if the new product would in fact be advantageous to the current.

The replace/repair choice will be largely based on a financial comparison. Although many factors are the result of guesswork (the anticipated maintenance cost and production need), a conservative view should be taken to ensure that uncertainties are covered.

c. Buy new/used decision

When buying equipment favours repairing it, the next question arising is whether to buy new or used. Usually the first thing that comes to mind when mentioning used, is second rated or inferior. Depending on the conditions, used equipment might still serve its purpose very well and at a reduced investment. According to Hough & Ashley (1992:121) the following factors should be considered when deciding between new and used equipment:

- *Cost comparison.* A detailed cash flow is recommended to ensure that the new equipment is less expensive than the used for the required life duration. The initial investment, expected maintenance and repairs as well as the expected salvage at the end of its life should all be incorporated into the equation.
- *Lead-time for new product.* New equipment can sometimes have long lead times to delivery. If the equipment is needed urgently, acquiring used equipment can in that instance be beneficial.
- *Availability and conditions of used.* The condition of the used equipment is one of the biggest influencers in this choice. Equipment in a poor condition is much less likely to be considered than equipment in a good condition. Used equipment may however not be available, making the new equipment the obvious choice.
- *Remaining life of equipment.* The new equipment will naturally have a longer remaining life, but should the equipment only be needed for a short time, the remaining life can be ignored.

d. Lease/purchase decision

Items acquired for resell, value add through manufacturing or consumption are always purchased. Capital equipment is usually very expensive, which complicates the decision of purchasing or leasing. Hough & Ashley (1992:120-121) mention the following aspects to be considered when choosing between leasing and purchasing:

- *The cost of leasing.* The finance charges in a lease should be compared to the time value of money for the company.
- *Duration of requirement.* If the item is only needed for a short length of time, it may be better to lease, as it could be difficult to resell equipment.
- *Availability of funds and ease of financing.* Leasing is often a good choice when capital is limited or not available.
- *Potential for product obsolescence.* A major reason for leasing is to avoid purchasing products that become obsolete rapidly, for example computers.

The four major different structures of leasing relationships are depicted in Figure 7. (Matthews, 1974:5-11)

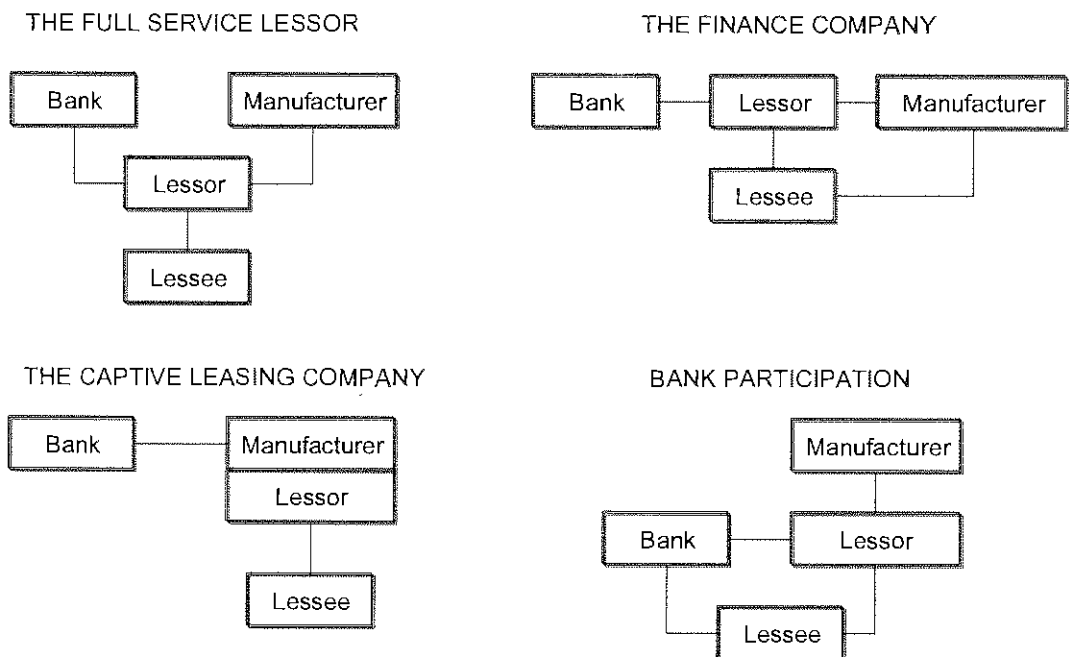


FIGURE 7: LEASING STRUCTURAL RELATIONSHIPS



These four different types of leasing relationships operate as follows:

- *Full service lessor.* They are the most common in the automotive, office equipment and industrial equipment fields. In this case the lessor performs all services, purchases the equipment to the buyer's specifications, and has its own source of financing. This type of lessor generally obtains discounts or rebates from the equipment manufacturers, which are not disclosed to the lessee.
- *Finance Lease Company.* This type of lessor does not purchase or maintain the equipment, so that the lessee deals directly with the equipment manufacturer. The lessor frequently has access to funds at close to prime rate and is able to make profit by lending above this.
- *Captive leasing.* The prime purpose of captive leasing is to encourage the sale and use of the parent companies' equipment. Original manufacturers of equipment may choose to lease rather than to sell are the following:
 - Secure either wider distribution or a higher margin.
 - Reduce the credit risk.
 - Sell a full line or increase the volume of sales of supplies.
 - Control the second hand market.
 - Stabilize the company's growth through securing distribution in times of recession when sales, especially of new as contrasted with used equipment are difficult to make.
 - To control servicing.
 - To protect a patent position
- *Bank Participation.* There are advantages to bank participation in cases where lessee has a good credit rating. The bank may be willing to finance part of the lease at rates slightly over prime, because it is a low-risk and low-nuisance lease.

The type of product, its future intended use and the market in which the company operates, are the main drivers towards deciding how to acquire which products. Economic calculations and market expectations should form the basis when making a product-purchase decision.

The acquiring decision discussed in this paragraph is not one to which e-procurement will have significant influence. The marketplace technology used by e-procurement can however assist by providing the cost of items should companies consider to buy rather than to make or provide second-hand alternatives if new products are deemed too expensive.



3.3. Product Types

The type of organisation will largely determine what types of products are procured. Hough & Ashley (1992:105,298) classifies products procured into three broad categories:

- ❑ Production material used in products being manufactured
- ❑ MRO (Maintenance, repairs and operations)
- ❑ Capital equipment

Other categories can be added depending on the business such as:

- ❑ Services
- ❑ Construction contracts
- ❑ Finished goods for resale
- ❑ Office supplies

In the manufacturing organisations all of these, except goods for resale, are usually included within the MRO category.

Thompson *et al.* (2000) distinguishes between direct and indirect products procured in the business-to-business procurement (B2B procurement) arena. Direct goods are items that contribute directly to company sales, it being for production or resale. From the above categories, production material (raw material or components) and finished goods for resale reside here. Indirect goods support the main line of business and can be seen as enabling goods. MRO, capital equipment, services, construction contracts and office supplies are included in indirect goods.

Fearon *et al.* (1993:639) adds that products can be distinguished further into standardised or differentiated. A standardised product is one that is exactly like those produced by all the other producers of that product. Sellers of standardised products know that the market is very sensitive to price because it is relatively easy for buyers to comparison shop. A truly differentiated product is in some respect different from all the other producers' products. That is, the product has some feature that no other product has.

Table 6 gives an indication of the product classification in the B2B procurement arena (Gadde & Håkansson, 1993:13-14; Lambert & Stock, 1992:488-490; Fearon *et al.*, 1993:639).



TABLE 6: PRODUCT CLASSIFICATION IN THE B2B PROCUREMENT ARENA

	Industries		
	Production	Retail	Service
<i>Direct goods</i>	Raw-, processed materials and components depending on the type of manufacturer.	Finished goods for resale	No direct goods, unless company is involved in selling certain products.
<i>Indirect goods</i>	Capital equipment (including major- and accessory equipment). Also packaging material, MRO and services	Packaging material, promotional material, other MRO items and services	Predominantly MRO expenditure and some capital equipment
<i>Tendency to standardise or differentiate</i>	Some products manufactured may require differentiated material and equipment. Most of the indirect goods will be standardised (except certain services rendered)	Will be determined by the type of retailer- specialised retailer will buy more differentiated material. Items such as promotional material and services will be differentiated	Almost all items will be standardised.

Clearly from the above table direct goods differ between the different industry types (ranging from raw material, finished goods to no specific products), while indirect goods are very similar between the different industries (predominantly MRO and capital equipment). Also direct goods are almost all specialised, while less expensive indirect goods (such as MRO) are almost all standardised.

As MRO is used in different types of industries and is very standardised, it is clear why e-procurement initiated focussing purely on MRO goods. Less standardised direct goods can also be targeted, but due to the product complexities and smaller application (only applicable in a few industries), it has much less “on-line appeal”.



3.3.1. Direct goods

a. Commodities

According to the Collins English Dictionary, a commodity is an article of commerce, an item exchangeable for economic wealth, a primary product or raw material. Fearon *et al.* (1993:629) mention that commodities can be crude or redefined products such as oil, chemicals, minerals, ores, and agricultural products that are used as the building blocks for an end product.

According to Hugo *et al.* (2002:134), commodities are often bought on world commodity markets. Leenders & Fearon (1993:337) mention that the prime function of an organised commodity exchange is to furnish an established marketplace where the forces of supply and demand may operate freely as buyers and sellers carry on their trading. According to Bernstein (1998:7) only after the mid nineteenth century a formal exchange market was formed for trading commodities where the farmer sold the commodity at a pre-negotiated price. This pre-negotiated price favoured both parties- the farmer knew he made a sale and the buyer knew in advance the price and could arrange a profitable sale before receiving the produce. A third party was borne- hedgers or traders, which never intended to purchase the contract. They aim rather to sell contracts profitable to buyers.

In order for a commodity to be traded on modern commodity exchanges, it needs to meet the following conditions (Bernstein, 1998:9; Leenders & Fearon, 1993:337):

- The commodity's price should fluctuate to create uncertainty in the market. This forms the basis of the futures market by creating potential profit and risk.
- It should be standardised and in its raw state if an industrial or agricultural commodity and are capable of reasonable accurate grading.
- A commodity that is perishable should have an adequate shelf life to meet the delivery of the 'future' contract.

Leenders & Fearon (1993:305-306) mention that the price of these commodities at any point in time is less important than the trend of the price movement. Careful and studious timing is essential to getting the right price, both the type of information required as a basis for such timing and the sources from which the information can be obtained differ from those necessary in dealing with other groups of items.

Leenders & Fearon (1993:338) mention that there are however limitations to these exchanges. Although a reasonable attempt to define the market grades, the grading is often not sufficiently accurate for manufacturing purposes. There are also other reasons why exchanges are not satisfactory for the buyer endeavouring to meet actual physical commodity requirements. On some of the exchanges no spot markets exist. On others there is a certain lack of confidence in the validity of the prices quoted, where few large buyers or sellers may dominate (for example crude rubber, of which the bulk is purchased by the large tyre manufacturers).

Although commodities can be seen as homogenous products, it has two differentiating aspects:

- *State of processing.* Commodities are found as raw material (in the case of mining or agricultural products), processed items (such as steel made from iron ore) and components (such as jewellery made from gold).
- *Physical properties.* Fearon *et al.* (1993:630) mention that the physical properties of commodities are usually more important than mechanical properties in purchasing commodities. There is a significant cost impact on the processing of a commodity, depending on its purity and the types of impurity present. These impurities may affect the rate at which the material is processed in addition to the yield of a particular batch or the purity of the yield. Analysing the effect of various types of impurities on the cost of processing will lead the wise buyer to establish bid factors for various types of impurities.

Due to its homogeneous nature, commodities are very well suited for exchange trading. Although it has a variety of physical properties and state of processing, the specifications for these items should be pre-negotiated. Although these trading exchanges are complex and very focussed entities, the integration with an e-procurement solution is viable. Unlike normal catalogue buying, purchases will be based on on-line auctions. Incorporating this into the e-procurement solution will ensure that purchases are still regulated and that significant post-trade information is available for improved future purchasing.



b. Production items and components

These products are bought, further processed in-house into end items such as steel sheet, plastic resins, rubber compounds, and aluminium tube (they are therefore referred to as input goods). Usually this division accounts for the largest spend in purchasing divisions of production companies.

Hugo *et al.* (2002:135) divides these products into standard production items and items of small value. According to Fearon *et al.* (1993:630); Hough & Ashley (1992:298); Gadde & Håkansson (1993:16-17); Hugo *et al.* (2002:135) production items have the following characteristics:

- ❑ As a rule they are sensitive to mechanical properties. The amount and type of impurities are important as they have an impact on performance characteristics such as strength, hardness and grain structure.
- ❑ The product is purchased in large quantities.
- ❑ The product is purchased repeatedly over an extended period of time, having fairly stable demand over the short term.
- ❑ Particular specifications are important and frequently unique.
- ❑ Specifications are often furnished by the buyer and may be proprietary.
- ❑ The unit price may be small, even in fractions of a cent, but the high volume translates into a large annual expenditure.
- ❑ The products usually are not shelf items, which mean they are not available out of stock. Consequently, lead-times are relatively longer.
- ❑ Prices are determined by quotation or by means of published prices in catalogues and price lists.
- ❑ From a purchasing perspective, they are often both physically and economically important items. Many of these products have an international market and their prices fluctuate in relation to the cycles of supply and demand.

Components are subsystems of completed products. According to Gadde & Håkansson (1993:15-16) components are identifiable parts of the end product the purchasing company manufacturers. From a purchasing point of view components can be subdivided into:

- *Technical components.* These components are manufactured by large companies working globally. The major buyers of these components have come to be so important that they have a name of their own- OEM companies (original equipment manufacturers).
- *Adaptation components.* These products are not very sophisticated from a technical point of view, but require some kind of adaptation to the buyer's product. Typical examples include processed and plastic components.

Items of low value have such small comparative value that the expenditure of any particular effort to check price prior to purchase is not justified. It is essential that the value ceiling of items in this category should be reviewed regularly, since prices tend to rise markedly over the short term under conditions of inflation.

In manufacturing companies the total annual expenditure on certain components are usually the greater part of the total annual purchases. The purchasing department in organisations in close co-operation with the manufacturing department will usually control these purchases. Both the number of people involved in the purchasing action, as well as a very "hands-on" approach with suppliers contributes to high cost of purchasing components. Therefore savings through utilising e-procurement technology will be significant.

Technical components are well suited for on-line buying as items are specified and used by more than one buyer. As the items are very specialised, it will require a significant amount of technical detail to ensure the correct item is bought and not a very similar incorrect item. A problem might occur in that the order lead-time for a product is not visible on-line. The Achilles heel of any direct material purchase is the lack of order integration and stock level visibility. Integration with both the vendor's (giving clarity on the stock on hand) as well as the purchasing (ensuring transaction reconciliation) company's ERP systems can very well solve this problem.

Adaptation components are engineered according to company specification and cannot be regarded as a catalogue item. Should these products be purchased on-line, it is doubted if critical mass for the item can be achieved. Even if the buying company can achieve sufficient on-line volumes for the component it is still doubtful to trade such a specialised item on-line.



3.3.2. Indirect goods

a. Capital assets

Capital assets are as the word indicates assets for which the cost is more properly chargeable to a capital account than to an operating expense account. Hugo *et al.* (2002:316-317) describe capital assets as "the necessary machinery or other important equipment used directly for, or contributing to, the production of goods or the rendering of services, connected with the major manufacturing activities of enterprises which use the equipment".

According to Fearon *et al.* (1993:655) capital assets are characterised as having a long life and require a relatively high dollar outlay for acquisition. The procurement frequency of these items is therefore also much less than other items procured in the organisation. These items include long-life depreciable items such as land and buildings, furniture, fixtures and equipment required for the manufacture and distribution of products.

Hugo *et al.* (2002:317) distinguish the following types of capital items:

- ❑ Manufacturing apparatuses such as lathes, milling, presses and automatic drills.
- ❑ Accessory equipment such as forklifts and generators.
- ❑ Administrative equipment such as office furniture, computers and bookkeeping machines.

Capital assets or equipment differs from materials, supplies and services in a fundamental way: it usually has a longer life-cycle than materials, services and supplies have.



Capital equipment has a wide array of characteristics and applications. In general, these equipment types have the following characteristics (Farmer, 1985:382-383; Gadde & Håkansson, 1993:146; Hough & Ashley, 1992:301-302; Hugo *et al.*, 2002:318-320):

- ❑ It requires a comparatively large capital outlay and is purchased in low volume.
- ❑ It is bought at irregular intervals and because of its relatively long life span, may not need to be replaced for several years.
- ❑ It is usually specialised and technical and will therefore include several departments.
- ❑ It takes a large amount of time to negotiate.
- ❑ There is a tendency to buy directly from the manufacturer or distributor, especially when non-standard items are required by the purchasing firm.
- ❑ Supplier selection is of high importance as after sales service is usually significant.
- ❑ It is based on derived demand- thus a purchasing thereof will take place when the demand of the company's final product increases.
- ❑ It usually occurs in a rational and economic accountable way.
- ❑ There is a increasing tendency to procure operational equipment by leasing

It is clear from the abovementioned characteristics that the procurement of capital items requires a rational approach with quantification of benefits in especially monetary terms being high priority. According to Fearon *et al.* (1993:657) the following important aspects are considered when procuring capital assets:

- ❑ Financial
- ❑ Technical
- ❑ User needs
- ❑ Other business considerations

Usually these equipment types do not function independently and factors such as its interaction with existing equipment as well as the type of raw materials used are important additional factors to consider. (Gadde & Håkansson, 1993:14)

Due to the high initial capital investment required, the decision is however largely based on financial viability. Fearon *et al.* (1993:661) adds that the total cost of ownership for these equipment includes the initial acquisition cost of the asset (capital investment) along with maintenance, repairs and salvage at the end of its lifetime.



Because capital assets are normally very expensive, strict controls and measures should be in place to ensure procurement is viable. The acquisition process starts with a needs assessment and concludes with final customer acceptance and a supplier critique. (Fearon *et al.*, 1993:664-666). Different to other items purchased, capital equipment will usually be reviewed by a board or panel of stakeholders. A feasible business case forms the basis of discussion at these panels and all other abovementioned factors are visited before approving the purchase.

The largest part of purchasing of capital items is executed in off-line through business case compilation and approval. Therefore rather than using an e-procurement solution, an e-business case solution (that could streamline the erection of the business case) is recommended. Due to the significant capital layout, these purchases will usually be initiated with the purchasing- or other executive level.

It is very important that through the business case process, detail specifications as well as preferred suppliers should be decided on. For standardised items (of which equivalents exists) the different preferred suppliers can be auctioned off against each other to gain the best price. In the case of specialised items (items manufactured for a very specific purpose of which no exact equivalent exists), on-line trading will be of little value. Negotiations for this type of purchase will remain very manual for years to come.

b. Maintenance, Repairs and Operations (MRO) Goods

According to Fearon *et al.* (1993:650) maintenance, repairs and operations (MRO) are expendable items, which are used by all organisations in the operations of their facilities and by manufacturers in the production of products. These items are consumed internally in the organisation and do not become part of any products.

MRO items include stationery, supplies (office, janitorial, plumbing, electrical and safety), first aid items hand tools and cleaning materials. It also includes the procurement of spare parts or disposables (such as lubricants) to support buildings, plant and machinery.



Service organisations such as hospitals, schools and banks usually buy larger volume of MRO supplies than manufacturing organisations. Fearon *et al.* (1993:651) and Hough & Ashley (1992:199) remark that often 80 to 85% of an organisation's purchases (number of purchases) are for MRO supplies. However, only 15 to 20% (usually higher at a service organisation) of the total purchasing dollars typically are spent for MRO items. Therefore, it is usually high purchasing volumes representing high acquisition costs for the organisation

It is mostly difficult to plan these purchases, which are repetitive in nature and irregular in demand. Maverick purchases (out of contract purchasing) are common as necessary items are seldom out of stock due to this unpredictable demand. According to Grieco (1997:2), 40-50% of all MRO items are maverick purchased. MRO purchasing is also plagued with a large number of different items involved, and is therefore characterised by an extensive exchange of information, particularly with regard to orders and payments.

According to Gadde & Håkansson (1993:17) the major objective in this type of purchasing is to find effective routines for dealing with the purchasing, rather than optimising each individual decision. This will contribute in minimising time and effort wasted in acquiring low-value MRO items. Hough & Ashley (1992:299-300) suggest that standardising and limiting the product range can assist in ensuring increased availability. Shopping for the best price is not cost effective when taking into account the low value of the items procured.

Grieco (1997:3,4,14) mention that the predominant strategies in reducing the cost of MRO purchases is to consolidate suppliers and to decrease the number of purchase orders issued annually. By reducing the purchase orders, the cost per transaction will decrease significantly. Fewer suppliers will reduce the maverick spend which will improve control over the buying process.

Grieco (1997:79-100) suggests that blanket orders and system contracts should be used for the supply MRO products. He suggests using a Kanban (card used in a JIT supply system) as a trigger for use, rather than making use of purchase orders. The advantages of using this system are the following:

- Decreased cost
- Less paperwork
- Reduced inventory carrying cost, because minimum inventory is carried
- Less emergency orders due to decreased lead times

MRO purchases are characterised by small order quantities, with a high cost of procurement vs. procured items and where frequent uncontrolled spending (maverick purchases) occurs. These standardised products are easily available and due to the unknown demand, employees tend to buy these products off-contract from a supplier around the corner. This has the unfortunate effect of less on-contract purchases, resulting in less negotiation power for better contract prices.

e-Procurement has the advantage of reducing maverick purchases through more “on-contract” buying. Also the system provides the ability to aggregate different requisitions into a single purchase order and thereby reducing delivery- and processing costs. MRO items are also very well suited for catalogue buying (buying products presented on a catalogue), making it even more suited for buying through an e-procurement system. Previously order tracking required numerous phone calls, but through using an e-procurement system employees can track the delivery status on-line. The majority of order lead-time currently is due to inefficient internal processes, which an e-procurement system can also improve. It is therefore clear that MRO purchases suite the use of an e-procurement system very well!

c. Services

No company is an independent entity; rather it requires inputs from various other companies. Similarly to products procured, services are also frequently obtained from outside the company’s boundaries. According to Leenders & Fearon (1993:586) examples of services procured by companies include amongst others advertising, arbitrations, engineering design, insurance and general consulting. Fearon *et al.* (1993:698) mention that purchasing services are unlike the acquisition of materials and demands greater knowledge of the generally labour intensive supplier base, as well as the competitive posture of the buying organisation.

According to Kurtz & Clow (1998:10-14) and Churchill & Peter (1998:289-293) services poses inherent characteristics not found in goods, namely:

- *Intangibility.* Services have a lack of tangible assets, which can be seen, touched, smelled, heard or tasted prior to purchase. Services are however found on a continuum of ranging degree of intangibility/tangibility called the goods-services continuum.
- *Perishability.* Inability of a service to be inventoried or stored- if a service is not used when offered; it cannot be used at all.



- *Inseparability*. It is the simultaneous production and consumption of services- the service cannot be separated from the person/seller rendering it.
- *Variability*. This refers to the random levels of service quality customers receive when patronising a service.

Another characteristic regarding the purchasing of services are that value can only be determined retrospectively. This makes for longer relationships between customers and service providers, especially as there is an important learning effect to be gained (Gadde & Håkansson, 1993:18)

Services usually fall with a company's MRO expenditure as it includes many types of repair services (such as that of office equipment, production equipment and capital assets). Services are usually labour-intensive, but may be capital-intensive as is the case in transportation and communications and are purchased by both public and private sector organisations. (Hough & Ashley, 1992:303). Services can be grouped into the following categories (Gadde & Håkansson, 1993:17; Fearon *et al.*, 1993:699):

- *Facility related*. This includes construction, equipment maintenance, ground maintenance and housekeeping.
- *Materials and logistics*. This involves inventory management, tariff auditing, transportation, salvage and reclamation and warehousing.
- *Communication*. This includes automated data processing, photographic printing, public relations, advertising and telephone.
- *Employee-related*. It encompasses cafeteria and vending, fridge benefits, training and counselling, travel and uniform.
- *Professional services*. This includes services such as accounting and audit, architectural and engineering, auctioneering, consulting and legal.

Based on the above, services can be divided into two types: i) standardised or homogenous and ii) differentiated or heterogeneous. It is difficult to divide the service categories into being standardised or differentiated, as some categories include both. Most categories, including facility-related, communication and employee related tend to be primarily standardised, except for construction services, public relations and advertising that are usually differentiated in nature. Professional services and materials and logistics also tend to be differentiated in nature.



Leenders & Fearon (1993:601) add that usually the lower the consumer contact, the more standard the service becomes. Standardisation of these services is also easier because of the standardisation and the common nature of the purchase. With many purchasers in the market, standard specifications are probably available. If there are many suppliers, it may be possible to use competitive bidding techniques, expect quantity discounts and use a fairly standard type of supplier evaluation. With highly customised services the specification process becomes much more difficult and the options more difficult to understand. The involvement of the end consumer in this specification process becomes more important. The possibilities of trade-offs in various make-or-buy sub options need to be explored before final specifications can be agreed to. The acquisition process itself may be less definite as various suppliers may offer substantially different options. Evaluation of supplier performance may have to recognise the purchaser's share of responsibility for quality at the point of delivery.

The market in which service is procured can generally be described as one involving a large number of buyers and suppliers operating in a market for specific services, with very little regulatory interference or restraint (Fearon *et al.* 1993:701). Many of the suppliers can be considered as small businesses, which offer both standardised and differentiated services. These service providers have some control over prices and engage in various forms of non-price competition, including advertising, copyrights and patents, personal referrals and public relations.

Procuring homogenous services has similarities to that of products, whilst the heterogeneous services require much more investigation and personal interaction. In both types of purchasing however, tangible items are normally obtained through identifying alternatives, choosing the best/most feasible alternative and implementation. Also services require much more detailed up-front investigation than that of products. According to Fearon *et al.* (1993:703) the process of purchasing services include:

- *Definition of the need.* This involves a make-or-buy decision process in which the opportunity cost of establishing the requisite resources for performance of the service is analysed by the buyer.
- *Statement of work (SOW).* A SOW is a description of the work to be performed. It includes measurable performance and acceptance criteria. The SOW should clearly explain how the service provider would be expected to adhere to any fiscal, schedule and performance criteria. A SOW is more prone to differentiated services, but some standardised services can also be expected to complete a SOW (such as maintenance and cleaning contracts).

- *Competitive bidding and negotiation.* At this point in the process, the buyer must decide whether to competitively bid or to negotiate the purchase. The buyer should define clearly the nature and scope of the procurement, the award criteria, required delivery date, proposal submittal date and the timing for the award decision.
- *Proposal analysis.* Similar evaluation is used to that of product purchasing. Analytical techniques such as cost analysis, value analysis and learning-curve application are used.

Kurtz & Clow (1998:35-55) add that the purchase process has the following three distinct phases:

- *Prepurchase Phase.* During this phase the buyer weighs the different alternatives available to him and the benefits each alternative would provide. Decisions are made based on input from internal factors (such as individual needs or wants and past experiences), external factors (the competitive options available to the consumer), firm-produced factors (such as promotions and advertising) and perceived risks (due to the experiential nature of services, they are perceived to have a higher purchase risk than goods).
- *Service Encounter.* This is the actual interaction point between the customer and the service provider and the service is performed or provided at this stage. What transpires at the time of consumption has a significant impact on how the customer will evaluate the quality of the service and future purchase decision.
- *Postpurchase Phase.* This begins upon completion of the service. During this phase consumers will make evaluations concerning the quality of service, their level of satisfaction or dissatisfaction and future purchase intentions. Satisfied customers will make repeat purchases, will be loyal to the firm and will communicate positive word-of-mouth to other possible clients. Dissatisfied customers will switch to another firm for future purchases and will generate negative word-of-mouth.

It is evident from the above that choosing a service provider can be a tedious exercise. The service delivery vehicle (the type of contract to be used) is another complexity that should be considered. Table 7 can assist in choosing the correct service delivery vehicle (Fearon *et al.*, 1993:708)

TABLE 7: SERVICE DELIVERY VEHICLE CHARACTERISTICS

Delivery vehicle	Nature and scope	Duration of contract
<i>Purchase orders</i>	Usually simple and straight forward	Usually once off
<i>Systems contracts</i>	More sophisticated service	Continuous, regularly scheduled, and/or long-term
<i>Service agreements</i>	Complex service delivery	Short- or long-term

These contracts could utilise any of the following price mechanisms:

- Time and material (the service provider is paid for services delivered and does not need to conform to a tender or budget).
- Fixed price (the service provider will receive a fixed amount and will not escalate if additional work is required than envisaged at the start).
- Fixed price with escalation (similar to fixed price, only an escalation is built on yearly, bi-annually, etc. basis).
- Cost type, with a fixed fee, an incentive fee, or an award fee. (This includes any of the above pricing with a reward received at the end).

Purchasing services are more complex than the purchasing of items. One of the major reasons being the fact that the performance is determined only after the purchase is complete. Therefore the buyer has to go through detailed investigation before commitment. Especially standardised services can easily be purchased through an on-line bidding process. More specialised services require significant manual intervention and –negotiation for which the on-line process will be of little value. e-Procurement favours the use of purchase orders as service delivery vehicle, although bidding on service contracts for longer periods could be valuable. Due to the many additional attributes of services compared to products, a more complex bidding algorithm is required taking cognisance of additional less tangible aspects.

3.3.3. Special products

Certain products do not specifically fit any of the abovementioned categories. These products either can be characterised in more than one category or have characteristics different to any other category.



Hough & Ashley (1992:314-319) mentions the following products as 'special products':

- Chemicals
- Electronic components
- Metal and metal products
- Packaging material
- Paint or coatings

These products and characteristics are discussed in the following paragraphs.

a. Chemicals

The main reason chemicals are not characterised as any other product group, are that they range from MRO (as solvents or cleaning agents to be used) to raw materials. This includes products such as benzene, caustic acid, ethanol, methanol and sulphuric acid. These products are often commodities.

The purchase approach depends on the product's use within the company. Where these products serve as inputs for the manufacture of other products a similar approach to purchasing raw materials should be followed. If these products are consumed within company boundaries (serving for instance as cleaning), its buying should be similar to purchasing MRO items.

b. Electronic components

The volatility of demand is the main reason why electronic components are rated as a special product. A payoff between sufficient stock for consumption and not over stocking due to possible price decreases should be maintained. Keeping in close contact with the market is also advisable, determining which products to purchase when. Due to these fluctuations in the market long-term contracts are advisable to minimise problems with price and delivery.



c. Metal and metal products

Similarly to chemicals, metal can either serve as raw materials (purchased as inputs for the manufacturing process) or for internal use (such as erecting a protective rail). What complicates the purchase even more is the state of processing of the product. The product can be purchased as iron ore, ingot (both raw material) or processed (casings or various types of steel). Steel is also available in various shapes, sizes and grades which complicates the purchase even more.

Important aspects to consider when purchasing steel are the following:

- *The intended application.* This will predominantly determine what size, grade and characteristic the raw materials should have.
- *The state of processing.* This will be dependent on the in-house capabilities. The make-or-buy process should be used to determine the most feasible solution.

The purchasing strategy is dependent on the state of processing. Should the metal be raw material, it should be purchased similar to raw materials. If the metal has been processed, it should be purchased similarly to components.

d. Packaging materials

Depending on its use, packaging material is made from various types of material. It is mostly used in manufacturing companies, but also has use for distributors and retail establishments. In manufacturing organisations it can be seen as raw materials (it adds value to the final product) or as MRO (it facilitates the product, both in the manufacturing or retail industry, such as pallets or carry bags). Hough & Ashley (1992:318) mention the following types of packaging material:

- Metal containers such as tin cans
- Bottles made of glass or plastic
- Corrugated paper used for shipping containers
- Pallets made from wood or plastic
- Metal or plastic strapping used to bind the containers together
- Display cartons or shelf cartons
- Polyethylene film and rolls of other types of plastic, which are used for wrapping or shrink wrapping

- ❑ Plastic pellets available in various shapes (sometimes called peanuts), which are used as filler and to protect products
- ❑ Urethane foam, which is moulded for bracing to protect fragile items
- ❑ Lumber, used for heavy-duty crates, particularly for overseas shipments or for large products
- ❑ Many types of adhesive tapes used to seal packages
- ❑ Padded envelopes
- ❑ Associated packaging material, such as bags, marking devices, twine, labels and staples

The purchasing strategy for buying packaging material is dependent on its intended use. Should it form part of the value of the product, it should be regarded as raw materials. Should it only serve to facilitate the product by means of transportation or display, it should be treated as MRO purchases.

e. Paint and other coatings

Once again paint, lacquers and varnishes can either be classified as raw materials (used in the manufacturing, for instance to cover automobiles or trucks) or as MRO (to protect or decorate the interior or exterior of buildings). According to Hough & Ashley (1992:319) the following aspects need to be considered when choosing the correct paint:

- ❑ *Composition of the paint.* Paint is made of 3 components, a binder, a dispersion medium and pigment. It should be determined how much binder and pigment are in the solution, as the dispersion evaporates when applied to the surface.
- ❑ *Ease of application and durability.* Durable paints usually take more labour to apply - therefore labour cost needs to be added to the cost of the paint.
- ❑ *Choosing a supplier.* The intended volume of paint as well as the duration of need should be used to determine from which supplier to use.

The purchasing strategy for buying paint and coating is dependent on its intended use. Should it form part of the product, it should be regarded as raw materials. Should it serve to protect or decorate, it should be treated as MRO purchases.



The bulk of the abovementioned special products are compositions of different types of direct- and indirect goods. When deciding whether an item is suitable for buying on-line (through e-procurement), their application within the organisation should be investigated. Generally products that are supplied by more than one supplier, used by more than one company and is bought frequently is suited for e-procurement. The inverse of the above is generally not well suited for on-line buying as significant manual intervention is required.

3.4. Chapter Conclusion

Numerous types of products were discussed, each having their own application and value within businesses. In summary products can be distinguished based on the following:

- *Function within the business.* Products are either input for outputs delivered by the company (direct goods) or purchased for internal consumption (indirect goods).
- *Product characteristics.* Products are either standardised (homogeneous) or differentiated (heterogeneous).
- *Product value.* Items purchased range from very low to high item value.
- *Number of suppliers.* Products are either supplied by a large or small supplier base.

The abovementioned characteristics are not independent, with the product characteristics and the number of suppliers being directly proportional (Homogeneous products are normally supplied by a large supplier base and vice versa). Figure 8 summarises the applicability of the above characteristics towards on-line buying or tendency for e-procurement.

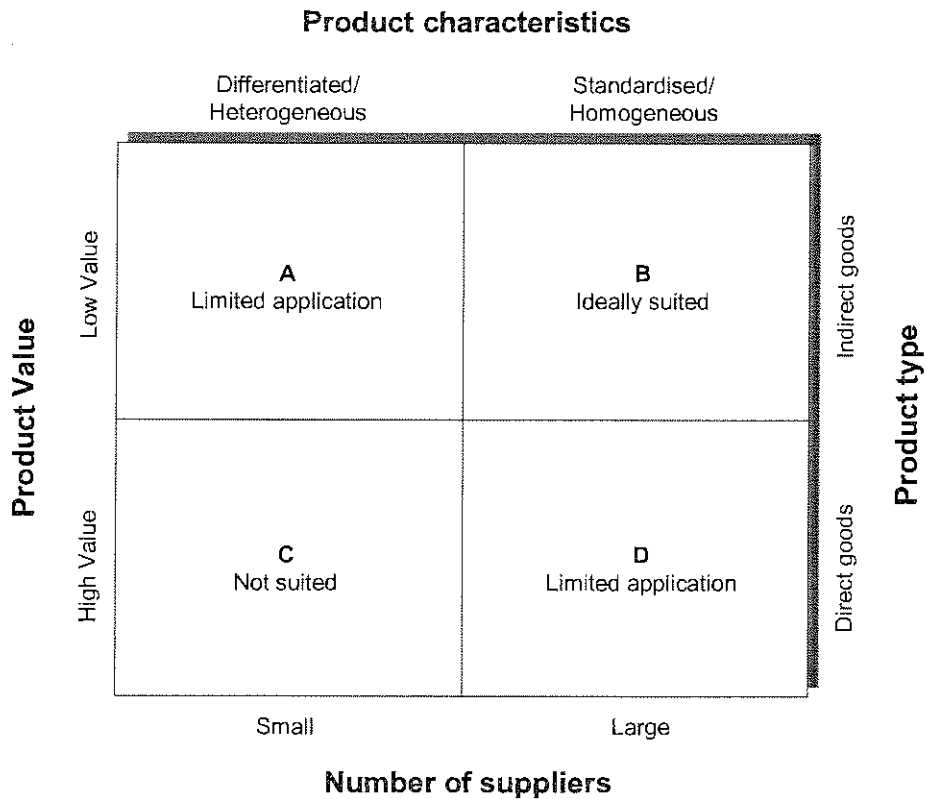


FIGURE 8: PRODUCT SUITABILITY FOR E-PROCUREMENT

Products are either well-suited, not-suited at all or have limited application for e-procurement. The four influencing factors contribute to a product's susceptibility for on-line buying (or e-procurement) as follows:

- ❑ *Function within the business.* Due to the uncontrolled spending as well as the large procurement cost vs. the cost of the items procured, indirect goods are better suited for e-procurement.
- ❑ *Product characteristics.* Standardised products can be bought from a catalogue and require little manual intervention. They are therefore better suited for on-line buying.
- ❑ *Product value.* Items of lower value tend to require less negotiation compared to higher valued items.
- ❑ *Number of suppliers.* Products supplied by a larger supplier base achieve critical mass much easier than one with a smaller supplier base.



CHAPTER 4

ROLE PLAYERS IN THE PROCUREMENT PROCESS

4. ROLE PLAYERS IN THE PROCUREMENT PROCESS

4.1. Chapter Introduction

Procuring items involve at least two parties, the buyer and the supplier. The buying and supplying process usually happens in the context of a market, bringing with its own governance and impedance towards trading. Both these aspects (the parties involved as well as the market situation) contribute for unique buying situations.

Gadde & Håkansson (1993:81) describes the interaction between the all resources and entities in view of a network model. Figure 9 portrays an image of the model

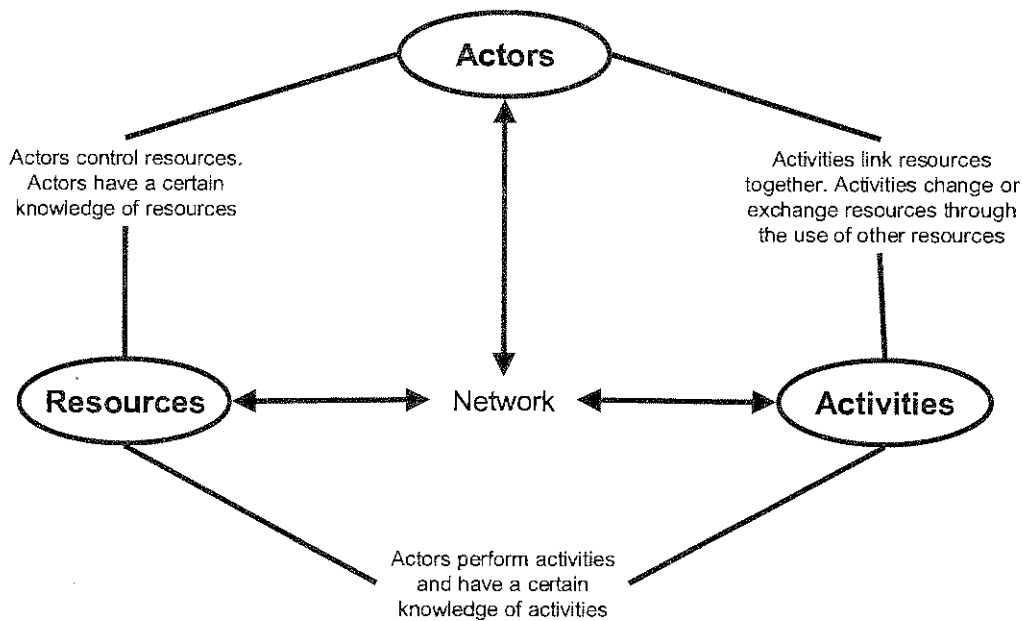


FIGURE 9: NETWORK MODEL

These three components include the following:

- ❑ **Actors.** These entities function at different levels, ranging from individuals to groups of companies. Actors aim to increase their control of the network.
- ❑ **Resources.** They are heterogeneous, human, physical and mutually dependent.
- ❑ **Activities.** Activities include the transformation activity, the transaction activity, activity cycles and transaction chains.



According to Gadde & Håkansson (1993:80-94) these three components (activities, resources and actors) are dependent on each other. Activities include all procurement related actions performed by the various actors in the supply chain. The activities are dependent on other activities up- or down-stream in the supply chain and should be viewed in context. Actors use resources to enable activities and the following resources are worth mentioning:

- Technical resources
- Input goods
- Personnel
- Marketing resources
- Capital

Actors perform activities usually by use of resources. Suppliers are the most important group of actors from a purchasing point of view. Large buyers (who can sometimes be competition) also tend to influence the purchasing arena. Second- and third-tier buyer-supplier relationships forms up- and downstream in the value chain that will also play a role. Other actors include consultants, technical advisors and the buying firm's main customer.

Chapter 4 serves to determine the role-players in the full procurement process as well as their role and value. Each role player's value in the original procurement model as well as in an e-procurement model is discussed. The typical buyer-seller relationships in industry are determined as well as its role in using an e-procurement system. This chapter will predominantly focus on the actors and to some degree on the activities in the network model.

4.2. Actors in the Purchasing Arena

As mentioned earlier, any buying situation involves two parties, namely buyers and suppliers. The relationship between the buyer and seller can be described in terms of supply and demand, which must be known and matched. In other words, it is assumed that there are suppliers who can offer the specific product or service demanded by the buyer. This implies in itself that there are other buyers whose needs are identical with those of the company in question. This can also be expressed by saying that there is an established market in which neither the buyer nor the seller is unique (Gadde & Håkansson, 1993:167).

This section of the chapter aims to provide an understanding to regarding all aspects of both buyers and suppliers involved in typical business-to-business purchasing transactions.



4.2.1. Buyers

From the buying point of view, various people within the buying organisation are involved. According to Churchill & Peter (1998:192-195) the various organisation members that have roles to select, purchase and use the product are collectively known as the buying centre for that product. These members are usually not a formal group of people, but rather communicate to each other regarding the purchase. They mention the following roles in the buying centre:

- *Initiators*. These are people that identify a problem or need that can be resolved with a purchase.
- *Users*. People in the organisation that actually use the product.
- *Influencers*. People who affect the buying decision, usually by helping to develop specifications for the product.
- *Buyers*. People with the authority and responsibility to select a supplier and negotiate contract terms. Usually (depending on the size of the organisation) these functions reside within the purchasing department.
- *Deciders*. People with the formal or informal power to select or approve a supplier. For items of high value, a board or executive committee may apply.
- *Gatekeepers*. People who control the flow of information into the buying centre. In larger organisations these people include secretaries and purchasing personnel.

Lower value purchases exclude some of the mentioned role players (such as the initiator, influencer and gate keeper), while influencers, buyers and deciders have the largest influence on any specific purchase. The type of product purchased as well as its value rather than the e-procurement solutions will determine which of the above role players are involved. An e-procurement solution will ensure a much speedier interaction between the role players, automate interactions (reduce telephone conversations and paper documentation) and will also through automated workflow, increase control over the purchase.

Parkinson & Baker (1986:164) mention that the interrelationship between organisational members participating in the buying process should receive focus as this impacts the purchasing decision. Basic issues here are the influence these individuals have on each other and their behaviour in areas such as bargaining, forming of coalitions and resolution of conflict. They mention the following characteristics to be taken cognisance of:



- a. *Personal and organisational 'demographics'*. These include age, socio-economic background, education, organisational position (defined by departmental affiliation and hierarchical level), tasks and roles in buying, length of service in the company and responsibilities.
- b. *Personality traits*. These general characteristics, which exert little direct influence on behaviour may mediate response in some situations and usually have limited direct relationship on the organisational buying decision. These are for example self confidence (general and specific to individual situations), innovativeness, cognitive style, need for certainty, social desirability (need for rewards or conformism), opinion leadership, and cooperativeness.
- c. *Buying related attitudes*. This includes tendencies such as attitudes to the importance of the purchasing function itself, product related attitudes for specific purchases, sales force competences, and the specifications of particular suppliers. These influences will have a decisive impact on the buying decision, which makes it important for the supplier to be able to predict them.
- d. *Buying related knowledge*. This refers both to general experience and knowledge about the buying situations which the buyer may become involved in and specific knowledge about the task of individual stages in the specific buying situations, such as the search for suppliers and the evaluation of competing alternatives
- e. *Perceptual patterns*. The buyer's perception of the buying situation, which he or she faces, is a function of individual attitudes and experience of related situations. This perception is influenced by the marketing communications of suppliers (advertising, sales personnel, trade fairs, etc.) as well as the risk, which is seen in particular situations.

In essence the influences can be summarised in three aspects: i) Buyer related, ii) Product related and iii) Buying situation related. An e-procurement system will have very little impact on the buyer related characteristics (number a and b above). This factor will rather impact the choice of utilising an e-procurement system (e.g. due to the buyer's background he/she might not comfortable with on-line buying).

e-Procurement systems do however impact both the product related as well as the buying situation related characteristics (number c to e above). On-line solutions tend to "commoditise" products, removing biased perceptions for better presentation of certain products or items.



4.2.2. Suppliers

The type of supplier is very much dependent on the channel strategy the company chooses. Previously the channel very much depended on the channel the selling company thought best, giving little thought to buyers' wants. Rackham (2000:40) supports this by mentioning that "sellers can't choose channels for reaching customers anymore; rather customers will choose their channels for reaching you!"

Haas (1992:431) distinguishes between the differences between channel strategies of business and consumer markets. Table 8 shows the main differences between consumer and business channel strategies.

TABLE 8: COMPARISON OF CHANNEL STRATEGY FACTORS

Factor	Consumer market	Business Market
<i>Importance of channel strategy in marketing mix</i>	Very. Consumers relate retail outlets to product quality and company image.	Critical. Stock outs and delays cause major and costly delays for many business customers.
<i>Channel control</i>	Channels usually dominated by either manufacturers or large retailing outlets.	Dominated by manufacturers, with the exception of some industrial distributors.
<i>Length of channels</i>	Often long, passing through many levels of independent intermediaries	Typically short and often direct with no independent intermediaries involved
<i>Intermediaries</i>	Many types used (e.g. wholesalers, retailers, jobbers, brokers, agents)	Two types most widely used: industrial distributors and manufacturer's representatives
<i>Amount of goods and services sold through intermediaries</i>	Bulk of products goes through intermediaries. (Estimated at 95%).	Bulk of products goes direct. (Estimated at 75%).
<i>Buying customer characteristics</i>	Choice of retailer often emotional and based on image.	Choice of intermediaries based more on performance
<i>Customer inventory requirements</i>	Often extensive at wholesaler, retailer.	Normally extensive, and customers rely on channels
<i>National/major/house accounts</i>	Only with large intermediaries such as retailers and wholesalers	Common with large customers and intermediaries
<i>Strategic partnership or other relationship</i>	Relationships primarily based on customer loyalty and satisfaction	Partner relationships common between manufacturers and channel intermediaries

The major difference between consumer and business channels are that business channels are typically shorter, even if intermediaries are used. Although the scope of this dissertation excludes the business-to-consumer (B2C) market, purchasing activities of retailers and wholesalers (typically found in the consumer channel strategy) are included. Some focus will therefore be given to the consumer channel strategy (especially retailers and wholesalers).

Haas (1992:432), distinguishes between the following entities functioning in delivery channels:

1. Manufacturer
2. Manufacturer's Representative
3. Manufacturer's Branch
4. Industrial Distributor

Basically two types of suppliers exist, namely manufacturers and intermediaries. The possible delivery channels are shown in Figure 10.

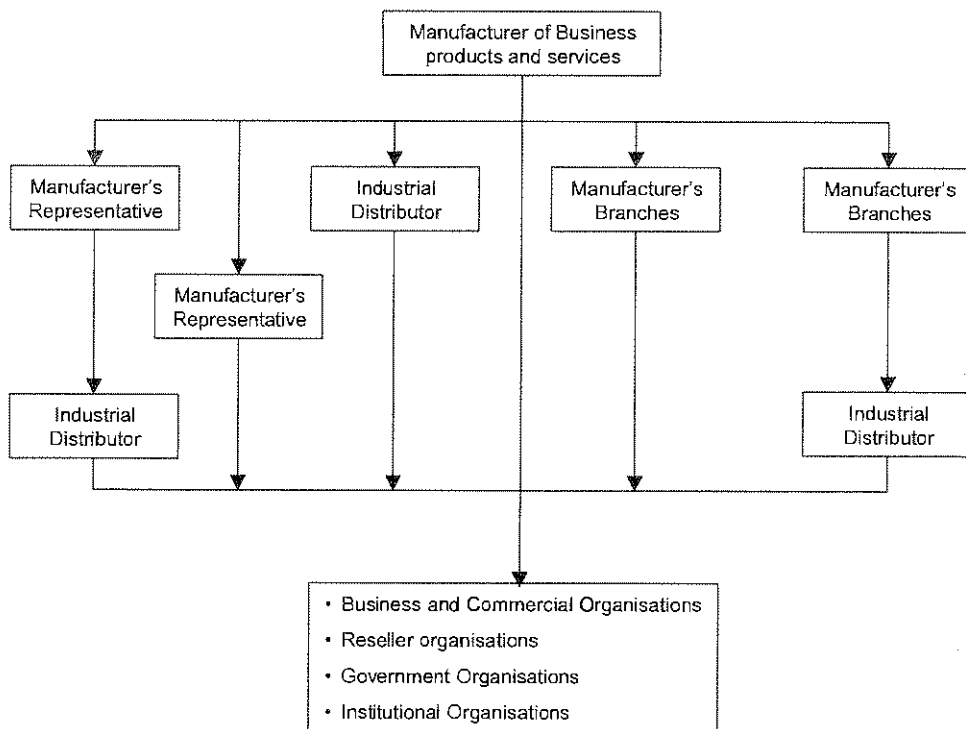


FIGURE 10: STRUCTURE IN CHANNELS IN BUSINESS PURCHASING



Although Wholesalers are not included in the above diagram, Lambert & Stock (1992:73) adds them to the distribution channel. Wholesalers sell to retailing companies, which are within the scope of this document. Wholesalers will therefore also be handled in the discussion. The three business “suppliers” form the following possible channels:

- ❑ Direct to the buying company
- ❑ Through industrial distributors to the buying company
- ❑ Through manufacturers’ representatives to the buying company
- ❑ Through various combinations of distributors and MRs to the buying company
- ❑ Through wholesalers to the retailing who supply to customers

The following paragraphs will further discuss each of these channels independently.

a. Direct channels

According to Haas (1992:436-437) direct channels means that no independent intermediaries are involved. Haas distinguishes between the following types of direct channels:

- ❑ *Field salespeople.* These people contact the customer, selling goods and make directly contact either from the factory or from a regional branch location or warehouse.
- ❑ *Inside salespeople.* This involves using telephone salespeople in a call-centre to which orders are placed.
- ❑ *Telemarketing.* It is an expansion of inside sales into telecommunication technology, such as computer-to-computer technology between buyers and sellers. A good example is EDI technology.
- ❑ *Catalogues.* This business channel requires no personal contact and is used for standardised products. Customer selects an item off the catalogue and is shipped.
- ❑ *National or major accounts.* This may be called a corporate or key account. Usually large and important customers are dealt with in this regard, bypassing any intermediaries. These customers are serviced either by top executives, a sales specialist or an independently formed division for sales to these customers.

The bulk of products currently purchased through e-procurement are standardised. This removes the need for field salespeople and inside salespeople for frequent ordering. These sales people may take on more of an advisory role for purchasing standardised items, while for more specialised products field salespeople in its current will be valuable.



b. Indirect channels

i) Industrial distributor

According to Haas (1992:438-444) an industrial distributor is an independently owned and locally managed entity that buys, stocks and sells the production tools, operating equipment and maintenance supplies used by all forms of industry. In short, this is a wholesaler in business markets as opposed to consumer markets. He distinguishes between the following types of industrial distributors:

- *The specialist.* A specialist is defined as a distributor where one product category consistently accounts for 50 percent or more of total sales.
- *The generalist.* This is similar to an industrial supermarket; stocking a wide variety of goods and having no specific area of specialisation. In this organisation no major product category contributes 50 percent or more of total sales.
- *The combination house.* This is a combination of wholesalers and distributors that operates in both business and consumer markets.

Industrial distributors vary in size, but are on average medium sized. It is usually an intermediary that offers field warehousing, sales, and service capabilities into business markets. The advantages of using industrial distributors are the following:

- They usually retain close relationships with buyers, which make for easy information sharing, ranging from new product updates to problems experienced.
- They offer quicker delivery and service due to their location and warehousing their own stock.
- It can often be less expensive to purchase through this channel, as they break bulk and employ their own salespeople.

Although it seems that industrial distributors are the obvious choice, problems are also experienced trading through this channel:

- They are sometimes difficult to control and due to their information, tends to dominate the market.
- They often have a problem in keeping stock incorrectly- they may have too few of one type of product and too many of any other.



According to Haas it seems that industrial distributors are becoming larger and more specialised. Manufacturers are also reducing the number of their distributors so as to control the channel and eliminate marginal intermediaries more effectively.

Kistner *et al.* (1994:316) mention that the role of the industrial distributors are changing through the following aspects:

- They are increasing in size due to mergers and acquisitions.
- They are professionally managed and foster working partnerships with manufacturers.
- Their product knowledge, specialisation and technical competence are increasing, with a trend to diversification in product lines.

Industrial distributors are therefore becoming more critical members in the channel, linking suppliers to end-users. This evolution has resulted in a diminishing role of captive distributors (or manufacturers' sales branch). Although these sales branches have given the manufacturer the ability to feel the pulse of the marketplace, it reduces the manufacturer's relationship with the customer to one of price cutting, leaving everything else out the picture.

ii) Manufacturers' representative

These people are commonly referred to as manufacturing agents, engineering representatives, and even brokers. According to Haas (1992:444-445) a manufacturer's representative (MR) is a self-employed individual who represents one or more manufacturers on a commission basis. They vary from individuals operating from home offices to corporations in multi office set-ups.

Unlike distributors, MRs do not take title of goods and act as an independent salesperson that usually sells within assigned territories and is compensated on a straight commission basis for those sales. A hybrid form of MRs, called stocking representatives, provide warehousing and are a combination of representative and distribution. These people are used by manufacturers in business marketing in lieu of company sales personnel.



According to Haas (1992:446) the use of MRs are most appropriate in the following conditions:

- The product is not standardised but is closer to a make-to-order.
- The product tends toward technical complexity.
- Gross margins are not large.
- The market is composed of relatively few customers that are concentrated geographically and concentrated in a few industries.
- Customers order relatively infrequently and allow fairly long lead times.

Haas (1992:447) furthers that MRs sell any types of products, such as components, supplies to technical capital goods and complementary not competitive goods. The primary reason buying from a MR is the wide product range stocked, making it possible to choose between a wider range of options. This can however also be a disadvantage, especially if the product requires a great deal of specialised care which the MR might be unwilling to offer. Generally they tend to focus only on large customers. Due to these people being paid solely commission, usually only the best company sales people eventually become MRs, which in itself promises an above average purchasing experience.

iii) Wholesalers

Hugo *et al.* (2002:134-137) distinguish between the following types of wholesalers:

- *Full service wholesaler.* They provide a wide range of services such as advice on merchandise, credit extension, delivery and rearrangement in accordance with the requirements of the retailer.
- *Limited function wholesaler.* They provide only a limited service as in the case of self-service wholesalers, wholesale hawkers, rack robbers, desk jobbers and mail service wholesalers.



The following aspects will influence the decision to select a wholesaler:

- ❑ Kind of merchandise. Perishable goods or goods with high unit costs usually will be bought direct from the manufacturer or producer.
- ❑ The quantity purchased- the greater the number, the higher possibility of buying direct from the manufacturer.
- ❑ The location of the retailer- distant retailers will usually buy from wholesalers
- ❑ The market policy of the manufacturer- certain manufacturers prefer direct distribution, others use wholesale
- ❑ Availability of local wholesalers.
- ❑ The general buying policy of the retailer- in the case of franchising or speciality goods, such goods will usually be bought direct from the manufacturers or producers

Table 9 describes the advantages of buying from either wholesalers or manufacturers (Fearon *et al.*, 1993:724; Hugo *et al.*, 2002:134).

TABLE 9: BUYING FROM MANUFACTURERS VS. WHOLESALERS

Manufacturer	Wholesalers
Merchandise can be manufactured and packed according to the retailer's requirement	The wholesalers stock a wide range of products and can supply more readily
Lower prices may be negotiated as the middlemen is left out	Wholesalers are located more conveniently and in the close vicinity
Goods reach the retailer fresher because of direct dispatch	Retailers are not bound by minimum order quantities
Changes in goods, delivery or guarantee claims can be accomplished faster	Provide shorter lead times in fulfilling orders and therefore less inventory is carried
	Wholesalers can supply market information that the manufacturer is not always able to

c. Channel decision

Traditionally buyers try to buy as close as possible to the source, as intermediaries are seen as 'price padders'. Magretta (1998:107) mentions that buying "closer to the market" has the impact of shortening a company's buying cycle, making it more agile to respond to where the market is moving. This also has the impact of decreasing obsolete inventory. Especially in countries of Africa, South America or Asia tend to have a large number of intermediaries supplying an even larger number of small retailers. Lambert & Stock (1992:669) and Bucklin *et al.* (1996:106) add that middlemen add between 15 and 60 percent to the purchase price depending on the type of goods purchased.

Information systems and especially e-procurement are making trading with any party in the supply chain easier. While human intermediaries sometimes tend to monopolise the industry, systems will rather open up these channels. Martin (1995:190-191) furthers that bypassing intermediaries have the following advantages:

- ❑ Cost of goods is cut
- ❑ The process is often speeded up
- ❑ The intermediary organisation's list of clients is limited, a computer system's is extensive
- ❑ An operation of limited geography may become global in scope because computer networks are worldwide
- ❑ Electronic linkage of the parties may allow complete logistical reinvention

Disintermediation (the process of eliminating intermediaries) is shown in the Figure 11. Note the normal value chain (all the blocks) and the disintermediated version (only the highlighted blocks).

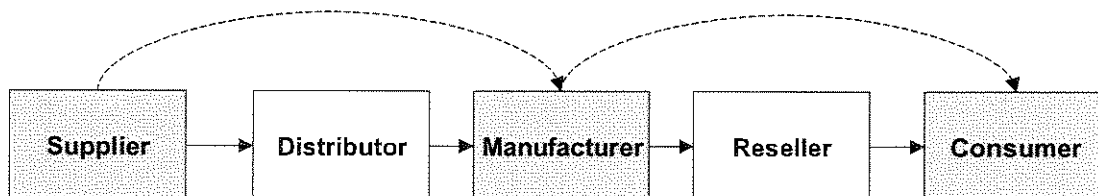


FIGURE 11: DISINTERMEDIATION



Gadde & Håkansson (1993:168) warn that intermediaries should not be bypassed by default. Bypassing intermediaries will mean that the purchasing organisation has taken over a large number of handling and warehousing activities that were previously done by the intermediary. It also increases the number of suppliers the buyer purchases from and decreases the volume purchased per supplier. The purchasing function is fragmented and the purchaser has to serve an important co-ordinating function.

Thompson *et al.* (2000) is of the opinion that eliminating these middlemen might decrease cost, but expectations of the same quality, service, and delivery may not be realised. Where the value-add of the intermediary is not achieved elsewhere in the chain, there is a less likelihood of displacement.

According to DiPietro (2000:50-52) in industries where intermediaries add very little value, direct selling through the Web has become the modus operandi, but in high-tech markets where product-specific knowledge and industry expertise is essential, indirect channels will still flourish. According to him, the Internet has opened up the possibilities for increased downstream partnerships. Through increased partner relationship management (PRM) the manufacturing company has the opportunity of quicker and closer information sharing. This will increase feedback from buyer such as satisfaction and demand as well as marketing information to buyers.

Sculley & Woods (2000:26-28) and Hagel & Armstrong (1997:12,26) are of the opinion that intermediaries will not completely disappear. According to them it will be replaced by infomediaries acting as brokers between buyers and sellers, shifting value from vendors to customers. These infomediaries will predominantly be systems providing information rather than dictating purchases. This will also enable lower commissions to be paid to these middlemen.

Choosing to buy from the correct supplier in the value chain can become a complex decision. It is therefore important to consider each of these suppliers' value contribution. According to Hough & Ashley (1992:122) and Hugo *et al.* (2002:135) the following aspects need to be considered in the choosing from whom to buy:

- *Importance of volume.* Manufacturers tend to sell only higher volumes, whilst intermediaries are more flexible on order sizes.
- *Need for local support.* A middleman will provide better local support than a distant manufacturer. If service is important, consider the middleman.

- ❑ *Specific need.* Intermediaries will supply the buyer's specific needs, for example colour, package, finish and quantity. Intermediaries or middlemen also tend to have specialised knowledge on various products that makes comparing between products easier.

E-Procurement in itself does not aim to change the channel constellation as such, rather it offers buyers to buy higher up the value chain much easier. With all the advantages and disadvantages of disintermediating the value chain, companies should consider a thorough investigation before making this decision. Figure 12 presents an evaluation model that can assist in this process.

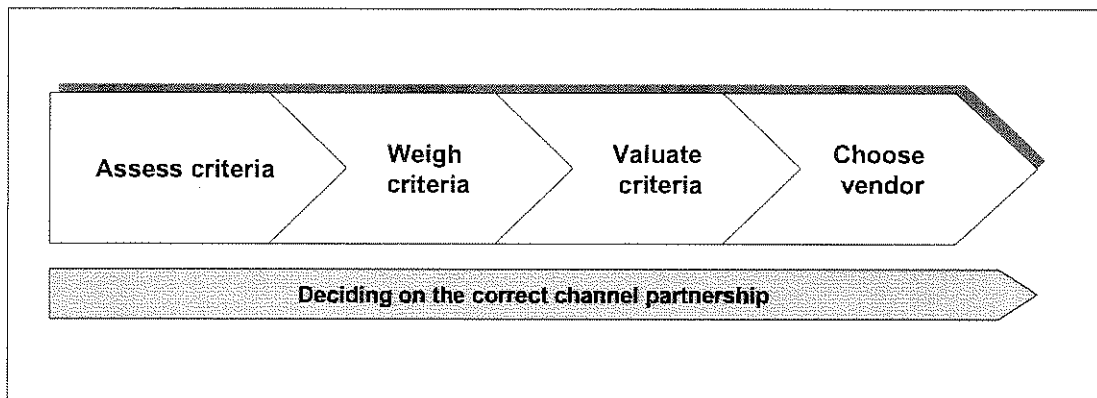


FIGURE 12: CHANNEL PARTNERSHIP EVALUATION MODEL

The proposed process for evaluating different channel partnerships is as follow:

- ❑ *Assess criteria.* Removing intermediaries for the value chain will probably result in savings, but could result in longer lead times and larger lot sizes. Companies therefore have to choose criteria necessary to measure the product purchased.
- ❑ *Weigh criteria.* The different criteria vary in importance for different products. To ensure evaluation is executed correctly, the criteria have to be ranked in order of importance.
- ❑ *Valuate criteria.* Each channel partnership has to be evaluated based on the valuation criteria.
- ❑ *Choose vendor.* The channel partnership with the highest rating is chosen.

Applying this logic in companies purchasing a vast number of different products on a frequent basis is not workable. The methodology is only recommended for products with different channel partnerships possibilities and where the cost saving between different alternatives is substantial.

d. Supplier selection and evaluation

According to Choi *et al.* (1996:334) supplier selection constitutes a very important part in the supply chain as it commits resources while simultaneously impact activities such as inventory management, production planning and control, cash flow requirements and product quality. The selection of suppliers happens on two occasions: i) When a new item is to be purchased, which was not purchased previously or ii) When it is believed that the current supply can be improved. Table 10 summarises possible reasons firstly deciding to maintain an existing relationship and secondly to search for new/additional sources of supply (Parkinson & Baker, 1986:52-54; Hough & Ashley, 1992:144).

TABLE 10: OPTING FOR NEW OR ESTABLISHED RELATIONSHIPS

Reasons for maintaining an existing relationship	Reasons for searching for a new/ additional relationship
There is little to choose between suppliers regarding specification, prices and delivery	None of the current suppliers supply a new (usually innovative) item
The company has a well-developed relationship with the supplier which is of mutual benefit	One or two suppliers dominate the market, making the market uncompetitive
A reciprocal relationship exists between parties, with the supplier supply a large volume (or % of purchases) to the company	The current supplier has inadequate capacity tied up over longer periods
	Existing suppliers do not meet buyers' requirements
	Supplier development is undertaken to ensure sufficient supplier performance

The reciprocal relationship mentioned as a reason for maintaining an existing relationship, should however be managed carefully. Reciprocity (mutual buying agreement) is the practise of giving preference to those suppliers who are also customers of the purchasing firm. (Hugo *et al.*, 2002:134). It should be considered that it takes an additional R1500 in



sales to generate the same profit as would be produced by a R100 cost saving in purchasing. Therefore, in considering reciprocity the total purchasing deal should be comparable at least with that of the competitors. In general, purchasing of non-standard items is less open to reciprocity.

To ensure that suppliers are evaluated equally, it is suggested to quantify their benefit. Gadde & Håkansson (1992:169-175) suggest using the following equation for quantifying supplier benefit:

$$V_i = R_i - TC_i \text{ in which}$$

V_i = the value generated with supplier i used

R_i = the revenue improvement in various dimensions created for the purchasing firm by supplier i

TC_i = the total cost of using supplier i

This means that the value of using a supplier is equal to all the positive effects minus the negative ones (the costs). The cost item can also be divided into 2, external and internal costs

$$TC_i = EC_i + IC_i \text{ in which}$$

EC_i = costs paid externally (price, freight, insurance, etc.)

IC_i = purchasing costs which arise in-house in relation to handling the supplier, i.e. costs for negotiation, contacts, invoice handling, etc.

This makes the total expression

$$V_i = R_i - EC_i - IC_i$$

This view is only based on financial contribution, disregarding aspects such as on-time delivery, customer satisfaction and number of products supplied. Establishing a broader view of supplier performance is required. Hough & Ashley (1992:151-157), Hugo *et al.* (2002:136) and Choi *et al.* (1996:337-338) mention the following aspects to consider when choosing a new supplier:



- ❑ *Location.* A supplier located closer does not necessarily mean its service is quicker or better. Location should be dependent on the type of material or goods supplied- naturally perishable goods should be selected from a supplier closer by.
- ❑ *Size and capacity.* It is important that the supplier has sufficient capacity to produce in the buyer's needs.
- ❑ *Product knowledge and experience.* Suppliers should be acquainted with the buyer's needs as some suppliers may have little experience producing the product at need.
- ❑ *Type of business, reputation, reliability and consistency.* The duration of time the supplier has been in the business as well as the potential profit made from the venture should be key considerations in choosing the best supplier. It also includes conformance to specifications, meeting deadlines and the quality philosophy.
- ❑ *Employee relations and customer service.* At suppliers with high personnel turnover, the quality needed may not be received.
- ❑ *Commitment.* Companies with a larger investment in research and development as well as product improvement may be much more suitable for longer-term relationships.
- ❑ *Price and Finances.* This includes the willingness of suppliers to reveal their financial records as well as the price charged for items.

Contrary to popular believe, price is one of the least important selection items, regardless of position in the supply chain, while consistency (encompassing quality and reliable delivery) is ranked very important. (Choi *et al.*, 1996:341)

Ellram (1990:9-13) mentions that as the importance of strategic partnerships increase, "soft" criteria that are usually difficult to measure should also be included. All criteria should also include future intent and not only current performance. Ellram therefore distinguishes between four categories for partner selection criteria: i) Financial issues, ii) Organisational culture and strategy issues, iii) Technology issues and iv) Other factors. The primary intangible aspects in the organisational culture category are the feeling of trust, strategic fit and top management compatibility. These factors are not easily quantified and a "gut" feeling approach is advised. Technology issues are the supplying company's attitude towards technology- how it will continually invest in the relationship, not only in the initial stages. A similar approach to that displayed in Figure 12 on page 72 is advisable for choosing the correct relationship.

e. Price determination vehicles

Arnold & Lippman (1995:1) distinguish between the following types of price determination vehicles:

- i. Sequential search
- ii. Auctions
- iii. Bargaining
- iv. Posted prices (usually entails a single fixed price or a non-linear pricing scheme and is common in retail stores)

Posted prices are different to the other three mechanisms as prices are fixed and cannot be negotiated. Table 11 compares auctions to sequential searching (Arnold & Lippman, 1995:2):

TABLE 11: AUCTIONS VS. SEQUENTIAL SEARCHING

	Auctions	Sequential searching
<i>Number of bidders</i>	Large	Smaller
<i>Supplier contact</i>	Little to none	Dedicated with each customer
<i>Ability to compare offers</i>	Comparison of offers is possible	No comparison of offers is possible
<i>Delays in selling items</i>	Little	More
<i>Threshold quantity</i>	Large number of items purchased	Few items purchased

Arnold & Lippman (1995:3) mention that self-selection mechanisms induce individual customers to reveal information regarding their own valuations, thus allowing the seller to price discriminate. Self-selection typically is accomplished by the seller's commitment to a fixed price-quality schedule. This is commonly implemented in retail stores, where a nonnegotiable price is posted. Auctions on the other hand are particularly well suited to selling an object in a market characterised by informal asymmetry. Usually auctions with a reserve price are the optimum selling institution in such markets. It is clear that different searching mechanisms are useful for different products and situations. Figure 13 assists in the selection of the correct price determination vehicle.

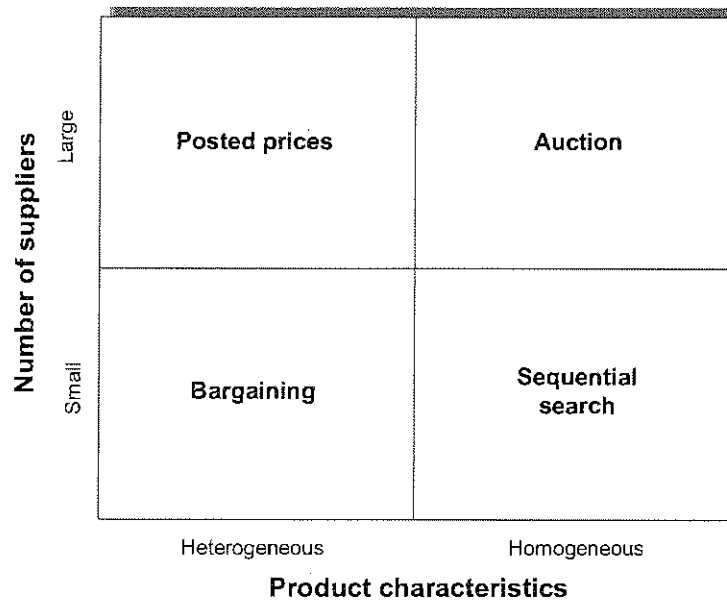


FIGURE 13: SELECTION CRITERIA SUITABILITY FOR E-PROCUREMENT

Selection of supplier through the Web interface should encompass other aspects that were not formerly addressed. According to Barua *et al.* (1997:119-121) all the abilities posed by the Internet emphasise the importance of evaluating criteria. Controlling the number of responses, especially in cases for bidding (comparing a large amount of competitive bids can severely increase purchasing costs) fosters the importance of having strict criteria in place. The selection criteria are very much dependent on the product characteristics: in homogeneous products, buyer look at lowest price (which includes seller's price, search, transportation and other costs); whilst for heterogeneous products other additional characteristics are important. Another benefit is that the coordination cost (comprised of the cost of setting up a relationship, search cost and transaction cost) is lowered through the introduction of Information Technology.

One of the aspects that the Internet increasingly makes possible is its ability to tie customers and supplier together regardless of geographical positioning. Purchasing from international suppliers based in other countries is therefore achievable. Min (1994:26-28) mentions the following additional aspects when considering purchasing from these suppliers:

- ❑ *Financial terms*, such as freight (owing to a lengthy distribution channel, transport and insurance expense are usually high) and payment terms (in international trade it is customary for advance payments).
- ❑ *Risk*, including political stability and local price control. Ignoring these risks can result in hidden costs for international sourcing.
- ❑ *Cultural and communicational barriers*, which includes cultural similarity and ethical standards. Since languages, business customs, ethics and communication devices vary from country to country, these aspects should be clearly understood before selecting suppliers.
- ❑ *Trade restrictions*, which includes tariff and custom trades. These duties can lead to substantial increase in purchasing prices, therefore the buyer should carefully estimated these additional charges before choosing the right source.

The commitment of the supplying company to technology issues mentioned by Ellram (1990:13) should be emphasised in e-procurement partnerships. Additions and upgrades to systems enhancing purchasing through e-procurement are only possible when both companies (buyers and supplier) are committed to upgrades and additions. Barua *et al.* (1997:125) describes supplier selection in Table 12:

TABLE 12: COST OF COMPONENTS PURCHASED

		Medium of transaction		
		Manual		Electronic
		Unit cost of		
Standard Product	Search	High	Search	Low
	Communication	High	Communication	Low
	Evaluation	Medium	Evaluation	Low
Unique Product	Search	High	Search	Low
	Communication	High	Communication	Low
	Evaluation	High	Evaluation	High

Barua *et al.* (1997:130-132) conclude that electronic networking technologies and related applications can add value in the supplier-selection process through:

- ❑ Compiling information on supplier attributes.
- ❑ Using intelligent searching to select a focussed initial pool.
- ❑ Develop applications to support the proposed evaluation strategies.

Going forward on-line evaluation methods and techniques should address more than just financial considerations. Aspects such as customer service, lead-time and product availability should be also be incorporated.

f. Number of suppliers

When looking to manage a supply base, the question of maintaining a large or small supplier base always surfaces. Both have advantages and disadvantages; it just depends on the purchasing scenario.

Table 13 gives a summary of advantages and disadvantages for managing a small or large supply base. (Gadde & Håkansson, 1993:41; Hough & Ashley, 1992:145; Bakos & Brynjolfsson, 1993:39)

TABLE 13: COMPARING A SMALL TO A LARGE SUPPLY BASE

	Large supply base	Small supply base
<i>Cost of managing the supply base</i>	High	Low
<i>Dependence on suppliers</i>	Little. Other suppliers in the base could be used as a replacement	Very. Few/No other suppliers can be used as a replacement
<i>Purchase price</i>	Suppliers are played off against each other for lowest price	Few suppliers to play off against each other
<i>Negotiation ability with suppliers</i>	Little, due to small purchases with numerous suppliers	Good. Purchases are aggregated with small supplier base
<i>Relationship with suppliers</i>	Distant	Closer

When considering the cost to purchase for suppliers, both the direct and indirect costs should be considered. Using few suppliers will have the advantage of lower indirect cost achieved (involving less suppliers will reduce the total administrative cost). There are also fewer transactions that take place, consolidated invoicing and fewer purchase transmittals. The direct purchase price will however be more significant. Increasing the supplier base will have the opposite effect. (Gadde & Håkansson, 1992:41; Laaper, 1998:119)

According to Bakos & Brynjolfsson (1993:38) in determining the optimal number of suppliers, it is natural to start with the premise that a firm would benefit by increasing the number of its suppliers, thereby broadening the range of its choices. This number is limited by organizational and technological considerations, such as the cost of setting up a relationship, search costs, and transaction costs, which can be collectively labelled "coordination costs." It may be assumed that potential suppliers offer products that differ in some desirable feature, such as price, product characteristics, or simply "fit." However, interacting with each supplier entails a coordination cost.

After surveying a number of suppliers, the buyer firm selects the product offering that provides the best value according to its set of criteria. The optimal number of suppliers is determined by trading off the cost of further searches against the expected benefit from identifying a better supplier.

It is therefore important to consider the indirect cost when involving more suppliers, the risk of having few suppliers and duration of commitment (contract duration) when determining the number of suppliers to be used. The relation of these considerations is shown in Figure 14.

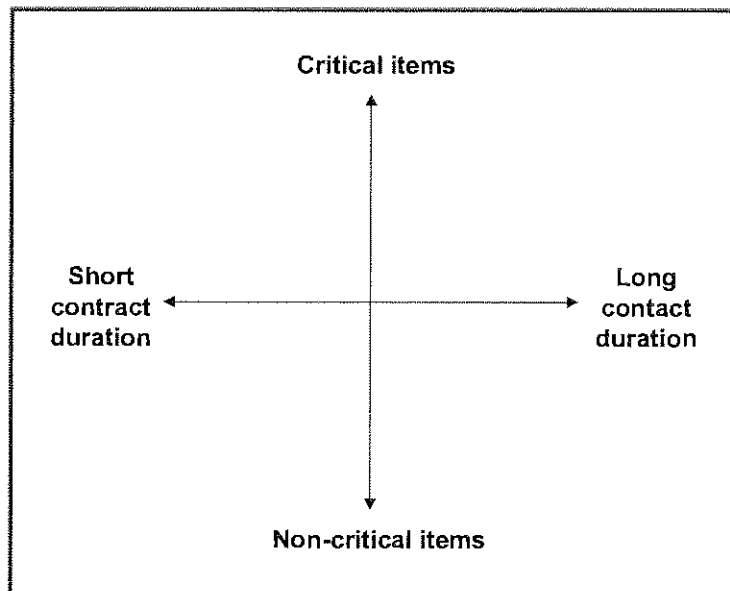


FIGURE 14: SUPPLY BASE SIZE CONSIDERATIONS

Two additional aspects that can be included are that of the product value as well as the frequency of purchasing the items. These two factors are however equivalent into those shown in the above figure. One of the bordering advantages of an e-procurement solution is



that of reducing the supply base. This advantage has to be seen in the light that e-procurement initiated from controlling and automating miscellaneous and MRO spend (refer Figure 5 on page 27). The MRP related items (or direct goods) are much more critical and a larger supplier base is recommended. For the capex items (or high value indirect goods) especially service contracts are critical and a larger supplier base (if possible) is also recommended.

4.3. Relationships

Different parties within the value chain are involved in different relationships. These relationships are different based on both the role players involved as well the characteristics of the relationship. The following paragraphs aim to firstly identify the typical relationships involved and thereafter to explain the characteristics of the relationship.

4.3.1. Vertical and horizontal relationships

Due to the current trend towards specialisation, an increased move towards partnerships is happening. Synergetic relationships and alliances formed increase both the viability of both parties within the market and are usually of joined advantage to both parties.

Relationships can either be vertical or horizontal. Vertical relationships between supplier and customer/buyer are known as partnerships and horizontal relationships, such as those between two suppliers are known as alliances (Gattorna & Walters, 1996:189-193). Kanter (1994:98) mentions that cooperative agreements between companies range along a consortium from weak and distant to strong and close. At the one extreme, in mutual service consortia, similar companies in similar industries pool their resources to gain a benefit too expensive to acquire alone (such as access to advanced technology). At the mid range, in joint ventures, companies pursue an opportunity that needs a capability from each of them (for example the technology of one and the market access of the other). The strongest and closest collaboration are value-chain partnerships, such as supplier-customer relationships. Companies in different industries with different but complementary skills link their capabilities to create value for ultimate users. Figure 15 depicts four types of channel relationships (Gattorna & Walters, 1996:192)

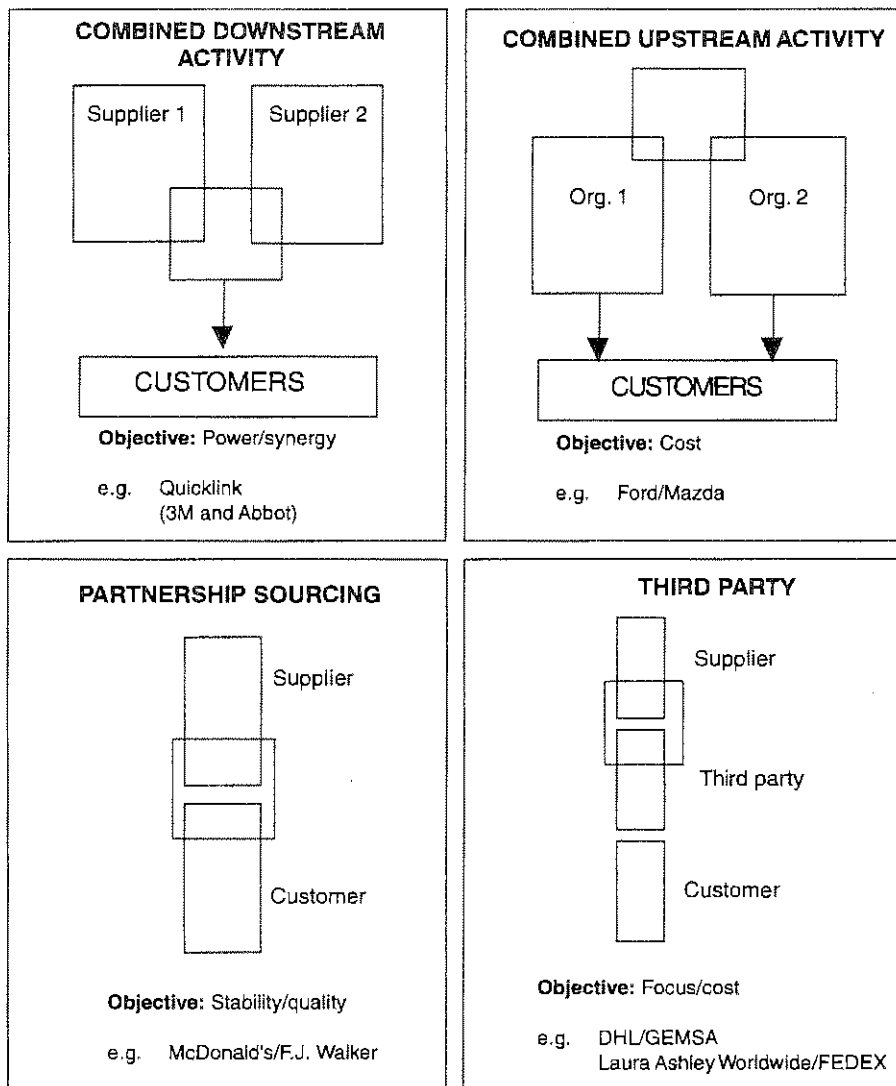


FIGURE 15: HORIZONTAL AND VERTICAL CHANNEL PARTNERSHIPS

Organisations typically enter into a partnership/alliance in order to achieve the following objectives:

- *Achieve strategic objectives.* One or preferably both parties see the other party as necessary in achieving certain goals.
- *Develop joint strategies.* The synergetic relationship formed has the ability to open up new markets that neither party previously focussed on.
- *Reduce risk while increasing reward.*
- *Improve returns on scarce resources.*



Such relationships should be formed between two existing parties, strong in their ability, bringing equal stakes to the party, otherwise an “us versus them” situation could very easily manifest. Ensuring that parties are on equal footing entering the relationship, Kanter (1994:100) developed the following 8 criteria necessary for inter-organisational relationships to be successful:

- *Individual excellence*: Both partners should be strong and could contribute to the value of the relationship.
- *Importance*: The relationship should be congruent with the strategic objectives of both partners.
- *Interdependence*: There should be mutual need of each partner.
- *Investment*: If each invests in the other, this signifies their respective stake in the relationship and commitment to the long-term prosperity of the venture.
- *Information*: shared information is an essential feature of the success of partnerships.
- *Integration*: In which partners develop linkages and shared ways of operating to facilitate their working together easily.
- *Institutionalisation*: Whereby the relationship is formalised, with clear responsibilities and decision processes.
- *Integrity*: The relationship should be based on mutual trust and confidence in each other.

Kanter (1994:108) concludes that these collaborative relationships need change from both parties. There are however limits to how much a company should change to accommodate the demands of an alliance. The potential value of the relationship must be weighed against the value of all the other company activities, which also make demands on its resources- including the time and energy of the executives. These alliances could also end for a number of reasons- the partner may be suitable for one purpose and not another, shifts in business conditions or strategy can mean that a particular relationship no longer fits as well as it once did.

The following paragraph aims to focus on the characteristics of these relationships that can form between parties in the value chain.

4.3.2. Buyer and Supplier Relationship Characteristics

“In purchasing then, the goal is to find mechanisms to offset or surmount these sources of suppliers’ power... Purchases of an item can be spread among alternate suppliers in such a way as to improve the firm’s bargaining power.”

Porter (1980, 123)



This statement by Michael Porter depicts the traditional view of supplier management, where buyers deliberately keep suppliers at an arm's length to avoid any form of commitment. What very few companies realise is that over the longer term relationships form the backbone of trading. According to Baldwin & Clark (1997:84) mentions that relationships and knowledge are the only two assets that really matter.

According to Gadde and Håkansson (1993:77) relationships are important from a company point of view due to the following reasons:

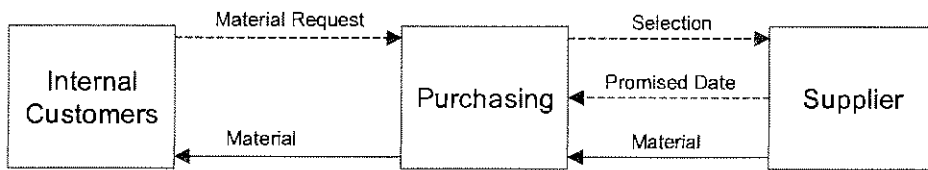
- Relationships have considerable economic (a large proportion of the company's activities are channelled through them) and technical impact (as they integrate the technology of the purchasing company with that of the supplier).
- Relationships comprise major investments of work both to establish a relation and to adapt the company to it internally.
- Relationships are 'dynamic' and require continual development in order for them to survive. If they are not, there is a clear risk that one of the companies will develop the opinion that the other company no longer considers the relationship important.
- Relationships are interrelated and interdependent and actually need to be seen as a network.

This section discusses the following aspects regarding the buyer-supplier relationship:

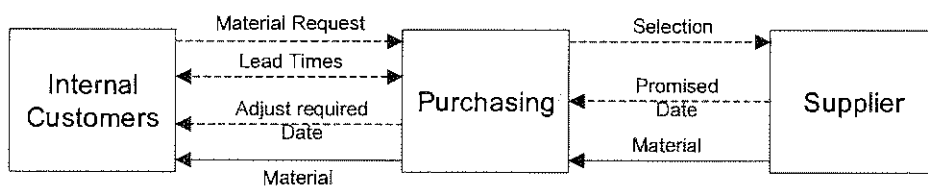
- Trust
- Power
- Conflict and co-operation
- Arm's length partnerships
- Buyer-supplier episodes

Figure 16 depicts the advantage of closer relationships with both internal customer and external suppliers (Rossler & Hirsz, 1996:38).

Supplier-based Approach; Limited Customer Involvement



Approach with Closer Customer Interaction



Key: ----- Information flow
 ————— Physical flow

FIGURE 16: CUSTOMER-PURCHASING-SUPPLIER INTERACTION

The paragraph also discusses vertical and horizontal relationships as well as the management of performance in relationships.

a. Trust

When considering relationships, trust is one of the fundamental parts. Trust usually involves dependability that both parties are reliable and would honour their word. According to Kumar (1996:95) the real differences between trusting and distrusting relationships are their ability to make a leap of faith: they believe that each is interested in the other's welfare and that neither will act without first considering the action's impact on the other.



Trust plays a very important role in the incorporation of systems to ensure smooth transaction of purchasing (such as an e-procurement solution). When both sides trust each other, they are able to share confidential information, to invest in understanding each other's business, and to customise their information systems or dedicate people and resources to serve each other better. Kumar (1996:105) furthers that many companies that want to move from conventional adversarial relationships to channel partnerships based on trust find that they do not yet possess the capabilities necessary to make the transition.

Companies that want to develop trust pay greater attention to partner selection. They select partners that bring distinctive competencies but similar values. Building trust into relationships also has the effect of reduced transaction costs, quickly adapting to marketplace changes, and developing more creative solutions to meet consumer's needs.

Gadde & Håkansson (1993: 71-72) furthers that trust should be reciprocal. Security in a relationship cannot be created on a single occasion, but must develop over time. The connection must be built up through a process of interaction in which reciprocal trust can successively be deepened. Interaction may lead to the development of a learning process in which both sides gradually get a better idea of the situations in which it is suitable to do business. To promote trust in relationships, personal contact is very important. Usually marketers ensure direct contact, but it is an aspect often neglected by purchasers, which will definitely harm the relationship in the longer term.

Kumar (1996:100-104) concludes with the following important rules that should be considered in mutual trust:

- Share gains as well as pain
- Strive for continuity in relationships
- Have consistency in policies
- Communicate constantly



b. Power

Enforcing power unto a buyer or supplier is normally seen as being detrimental to a long-term relationship. Gadde & Håkansson (1993:73) mention that the significance of a buyer or supplier to the other party determines how power will be handled in that relationship. Previously it was recommended that purchasers should try to behave in such a way that dependence did not arise (having numerous suppliers). The move towards long-term relationships and fewer suppliers have created dependence.

The problem associated with power/dependence is that they are seldom symmetrical. However, a certain amount of imbalance in one dimension may be set off against the equivalent but opposite imbalance in another dimension. If a purchasing firm wishes to try to get priority from one supplier despite the fact that it is not one of that firm's major buyers, it must begin by trying to make itself interesting in some other way, for instance from a technical point of view. Another characteristic attribute of the power/dependence relationship is that it usually varies with the general state of the economy. The seller may have more power during a boom, as may the buyer when supply exceeds demand. If a company should abuse their power during a recession, it may well suffer when an economic upswing arises.

According to Kumar (1996:93-95) exploiting power may be advantageous in the short run, but it tends to be self-defeating in the long run for the following 3 reasons:

- Exploiting power can come back to haunt a company if the tides change to give the other party the upper hand.
- The victims being exploited by power seek ways to resist, such as forming associations or buying groups, develop private labels, or pursue vertical integration or mergers to counterpart the power of manufacturers.
- If buyers and sellers work together as partners they can provide the greatest value to customers at the lowest possible cost. This also lays the foundation for sophisticated systems such as JIT, EDI and e-procurement systems that permits manufacturers to monitor sales in stores and to produce and ship their goods in response to actual consumer demand.

The following table depicts the difference between a relationship built on trust to one in which power is used extensively.

TABLE 14: POWER VERSUS TRUST RELATIONSHIPS

Principle	The Power game	The trust game
<i>Modus operandi:</i>	Create fear	Create trust
<i>Guiding principle:</i>	Pursue self-interest	Pursue what's fair
<i>Negotiating strategy:</i>	Avoid dependence by playing multiple partners off against each other	Create interdependence by limiting the number of partnerships
	Retain flexibility for self but lock in partners by raising their switching cost	Both parties signal commitment through specialised investments which lock them in
<i>Communication</i>	Primary unilateral	Bilateral
<i>Influence:</i>	Through coercion	Through expertise
<i>Contracts:</i>	"Closed" or formal; detailed and short term	"Open" or informal and long-term
	Use competitive bidding frequently	Check market prices occasionally
<i>Conflict management</i>	Reduce conflict potential through detailed contracts	Select partners with similar values and try to increase mutual understanding
	Resolve conflict through the legal system	Resole conflicts through procedures such as mediation or arbitration

For longer-term relationships the absence of manipulating power from either party will realise much more value for both parties. Should supply be once of in a market flooded by suppliers, the use of power can be advantageous. e-Procurement solutions are nurtured by the existence in trust between trading partners. Partners that do not trust each other will hesitate even more to trade in an on-line environment.

Power should however not be ruled out of the equation. Very few suppliers (especially the smaller suppliers) are likely to invest into an on-line way of trading without resistance. Jack Welsch, the previous CEO of GE forced all their suppliers to move on-line or they will not be able to supply GE in future (Corporate Leadership Council, 1999:24-26). A similar stance should be taken if companies want to realise full benefit.

c. Conflict and co-operation

Conflict and co-operation sound like opposites, but the existence of both foster a significant buyer-supplier relationship. The parties in a business relationship have both contradictory interests and shared ones. If they do not learn to deal with the contradictory ones, conflict arises. Usually it is believed elimination of all conflict in a relationship is a prerequisite for developing supplier relations. According to Gadde & Håkansson (1993:74-76) effective relationships require some collaboration, but they require an equal measure of conflict. They group buyer-supplier relationships according to Figure 17.

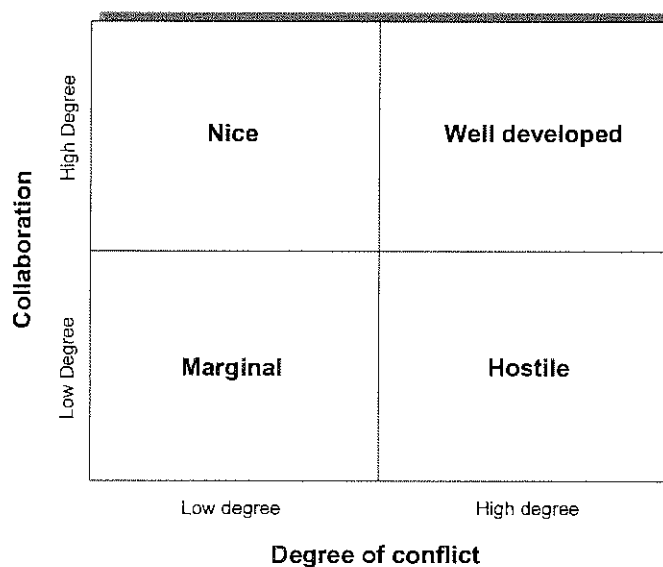


FIGURE 17: COLLABORATION AND DEGREE OF CONFLICT EXPLAINED

Relationships with a low degree of collaboration will not be meaningful to either party- such relationships are either marginal (in conjunction with a low degree of conflict) or hostile (in conjunction with a high degree of conflict). Significant relationships come into being with a high degree of collaboration. A relationship with low degree of conflict tends to be somewhat too 'nice', as the parties place too few demands on one another. Provided that it can be handled well, raising the degree of conflict in such a situation enables a better climate for innovation and development.



Conflict as such is therefore not necessarily undesirable as it very much depends on which way it is handled. If it is handled destructively it is detrimental to the relationship, while if it is handled constructively it ensures that the both parties receive optimal benefit thereof. One of the major possible conflict areas is the sharing of profits. According to Hay (1989:50-80) continuous development of collaboration to achieve 'mutual profits' or 'mutual success' is thus an effective way of preventing the escalation of conflict. Increased openness appears to be a prerequisite for this, particularly in relation to strategic issues. Expressions of this openness should include involving the supplier in the product-development process from an earlier stage than has previously been the case.

Closer co-operation has the benefit that lead times for design and development are shortened due to increased collaboration among channel players. Companies also need to collaborate more and more due to fragmentation and increased specialisation, another benefit of closer intercompany co-operation. (Gadde & Håkansson, 1993:9)

Ulrich (2001) tokens the optimising of supply and distribution channels as C-commerce or collaborative commerce. According to him C-commerce is the next evolutionary step beyond the simple process of selling goods or services to customers over the Internet. It has emerged as a priority because the Internet has made high-speed, widespread buying and selling possible and necessary. Companies need to cooperate to build common solutions to shared challenges.

d. Arm's length vs. Partnerships

The arm's length model has been more popular in Western companies, while partnerships more popular in Eastern companies. Dyer *et al.* (1998:58) mention that the partner model of supplier management has the following advantages to the arm's length model:

- Share more information and are better at coordinating independent tasks.
- Invest in dedicated or relation-specific assets, which lower costs, improve quality, and speed product development.
- Rely on trust to govern the relationship; a highly efficient governance mechanism that minimises transaction costs.

Table 15 depicts the difference between arm's length and partnerships (Dyer *et al.* 1998:59-60):

TABLE 15: ARM'S LENGTH AND PARTNERSHIP RELATIONSHIP

	Arm's length	Partnership
<i>Length of contract</i>	Short term	Longer term, usually strategic
<i>Continuity of relationship</i>	Frequent rebidding	Periodic reviews
<i>Degree of information sharing</i>	Low level of sharing	High level of sharing
<i>Relationship specific investments</i>	Low levels of investment	Higher to high level of investment
<i>Levels of trust</i>	Low levels of trust	High level of trust

Although the partnership model has numerous advantages, the partnership should not necessarily be the optimum relationship solution. Dyer *et al.* (1998:59,68) mention that suppliers should be analysed strategically to determine the extent to which the supplier's product contributes to the core competence and competitive advantage of the buying firm. Dyer *et al.* (1998:69-70) suggest using a durable arm's length model for non-strategic items, while using a partnership model for strategic items. The durable arm's length model differs from the traditional model in that the durable relationship suggests a longer rather than shorter term relationship. Prices are kept as competitive as possible through continuous price benchmarking.

Table 16 contrasting durable Arm's-Length Relationships with Strategic Relationships (Dyer, *et al.* 1998:72):



TABLE 16: ARM'S-LENGTH RELATIONSHIPS VS. STRATEGIC PARTNERSHIPS

	Durable Arm's-Length Relationship	Strategic Partnerships
<i>Product/Input Characteristics</i>	<ul style="list-style-type: none"> ◦ Standardised products ◦ Open architecture products ◦ Stand alone (no or few interaction effects with other inputs) ◦ Low degree of supplier-buyer interdependence (sequential interdependence) ◦ Low value inputs 	<ul style="list-style-type: none"> ◦ Customised products ◦ Closed architecture products ◦ Multiple interaction effects with other inputs ◦ High degree of supplier-buyer interdependence (reciprocal) ◦ High value inputs
<i>Supplier Management Practises</i>	<ul style="list-style-type: none"> ◦ Single function interface (i.e. sales to purchasing) ◦ Price benchmarking ◦ Minimal assistance (minimal interfirm knowledge-sharing routines) ◦ Supplier performance can be easily contracted for ex ante ◦ Contractual safeguards are sufficient to enforce agreements 	<ul style="list-style-type: none"> ◦ Multiple functional interfaces (e.g. engineering-to-engineering) ◦ Capabilities benchmarking ◦ Substantial assistance (substantial investments in interfirm knowledge-sharing routines) ◦ Self-enforcing agreements are necessary for optimal performance (e.g. trust, stock, ownership, etc.)

Suppliers that provided necessary but non-strategic inputs should be handled differently than those companies that provides strategic inputs. Because strategic products are usually of higher value and impact the end product more, closer relationships are advisable. Although non-strategic products have less impact on the final product, longer-term relationships are valuable; having the effect of minimised administration costs (less face-to-face communication), as well as obtaining economies of scale due to longer term purchasing.



e. Buyer-seller episodes

According to Gadde & Håkansson (1993:60-62) the whole buyer-supplier relationship is assembled of what they refer to as “episodes” or business transactions. Every episode is an interesting phenomenon on itself, and will be handled depending on its complexity and the history of previous relationship between the parties. Given situations (or episodes) are therefore not seen in isolation, but must be viewed and understood in the light of previous occurrences. Table 17 depicts four possible types of cases:

TABLE 17: FOUR CASES IN BUSINESS TRANSACTION

	No previous relationship	Well-developed relationship
<i>Simple episode</i>	Case 1	Case 2
<i>Complex episode</i>	Case 3	Case 4

Using this table, a company is able to categorise its purchases’ dependence on the existence of a relationship.

Case 1

Here the episode is a simple one, with a typical market situation in which both parties are truly independent and may be previously unknown to each other. Taking such an episode to its extreme, it may even be mediated via an exchange market. There is no past history and no likelihood that the transaction will lead to the initiation of a relationship. The purchases most likely to fall under case 1 are usually highly standardised raw materials or very simple products purchased in small amounts.

Case 3

Should companies have no previous relationship but the episode is complex, it generates uncertainty. Companies interceding into such a situation should handle the episode in such a way to build trust between parties. Should there be a possibility of similar purchases in future, case 3 type episodes gives both parties a good opportunity to get to know one another. The products procured in this episode range from a non-standard to a once-off purchase, for instance, when a firm buys a piece of equipment, which is not normally part of its plant. These once off purchases are normally of high cost.



Case 2 and 4

When there is an established relationship, each individual transaction always has to be seen in relation to it. In especially complex episodes, it should strengthen the relationship. Case 2 purchases include items purchased regularly which are standardised, such as MRO items. Although a relationship does exist for case 4 purchases, it is generally items procured infrequent with a higher item value and that is not always standardised.

Less complex purchases are more receptive for e-procurement. Therefore cases 1 and 2 are ideally suited for e-procurement. Cases 3 and 4 will require manual intervention and negotiation to ensure the correct items with specifications are bought. After detailed investigation has been conducted, it is possible to play different vendors off against each other through on-line bidding.

Through existence of a relationship in cases 2 and 4 the buyer is aware of previous vendor performance (including aspects such as delivery lead time, delivery accuracy, etc.), resulting in less uncertainty when buying on-line.

Throughout this part of the chapter it is clear that a number of aspects impact the buyer-supplier relationship that have different impacts on the commerce. In essence the most prominent aspects are:

- Is the relationship driven predominantly by power or trust?
- How well developed is the relationship?
- Does buyers and sellers generally co-operate or conflict with each other?
- How complex are the episodes between the buyer and the seller?

All these questions impact the suitability for on-line buying or e-procurement. Figure 18 visually shows this relationship.

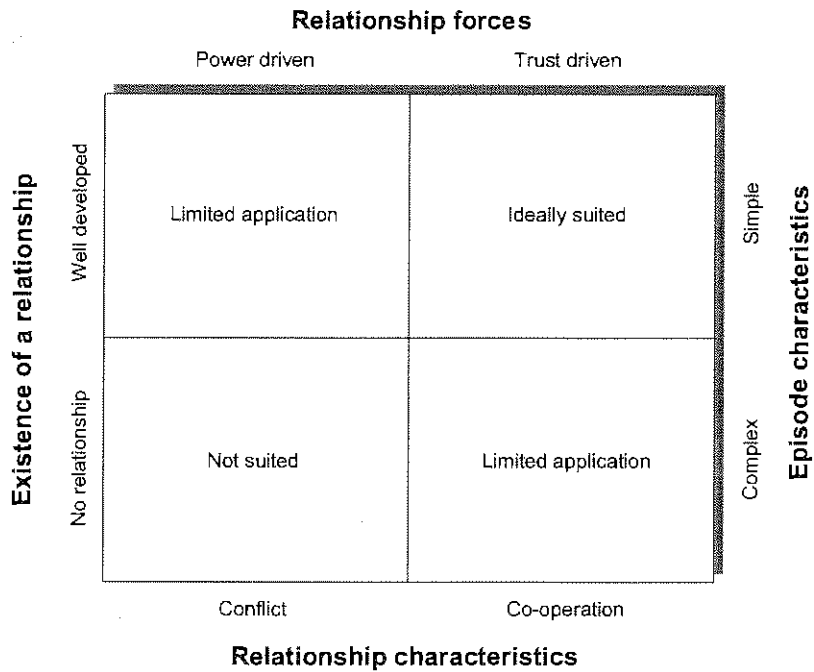


FIGURE 18: RELATIONSHIP SUITABILITY FOR ON-LINE TRADING

As mentioned previously the existence of trust in a relationship significantly impacts its suitability for e-procurement. Companies that trust each other are also more likely to co-operate in trading. Co-operation between buyers and suppliers is significant for e-procurement, as systems across company borders would need to be integrated to achieve full trading value. Furthermore companies are more willing to trade on-line with customers with whom they have an existing relationship, resulting in less complex trading episodes.

4.4. Forces in Markets

"This is hardly a conclusion that could be based on competition in a love, war, sports or any other field of human endeavour. Any boxer who climbed into the ring intent on being so perfectly competitive that he ignored his rival would have that particular idea knocked out of his head soon enough. I count myself lucky that I did my boxing before I did my economics. Fortunately, it never crossed my mind that I would be more competitive in the ring if I just minded my own business; otherwise I might have qualified for the 'Perfectly Competitive Boxing Citation'."

(Armstrong, 1982: xvi)

Paragraph 4.2 provided more insight towards buyers and suppliers within the B2B procurement arena. Trading between these players are not ring fenced and are impacted by market related forces. Porter (1980:3-33) mentions that five forces drive industry competition. Figure 19 describes Porter's five forces model.

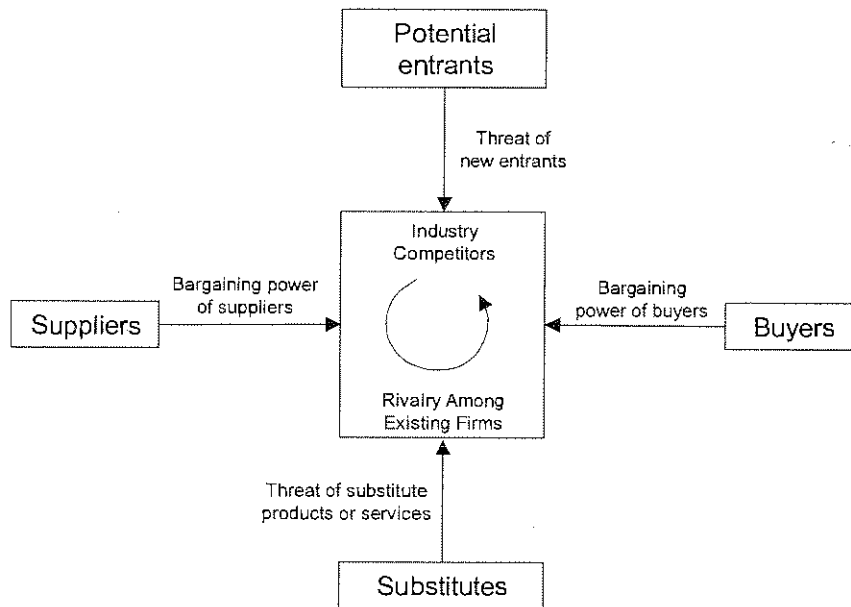


FIGURE 19: FORCES DRIVING INDUSTRY COMPETITION

Parkinson & Baker (1986:157-166) furthers Porter's model by adding environmental influences. According to them the principle environmental influences are:

- ❑ *Structure of supply market.* This has a major effect on the availability of items to the buyer. It also directly affects the buyer's ability to play an active role in influencing the marketing decisions of the supplier.
- ❑ *Nature of competition.* As the company's own markets become increasingly difficult to operate in, attention turns to improving the efficiency of the purchasing function as a means of improving or sustaining profitability.
- ❑ *Governmental intervention.* The influences of government on the company's buying behaviour can be seen in a wide variety of forms and includes its fiscal and monetary policy, political decisions as well as the exchange rate.
- ❑ *Changes in technology.* Changes in technology are also a major source of change in the nature of the buying decisions. New techniques, new materials, new components are all potential sources of comparative advantage to the customer, who can benefit by early purchase.

This section will specifically focus on the nature of competition and governmental intervention. According to Armstrong (1982:4) competition is “the act or action of seeking to gain what another is seeking to gain”. The success at which a marketplace operates is largely dependent on the governing forces enabling/ prohibiting free trade.

4.4.1. Supply and demand laws

Banks *et al.* (1987:19-20) mention that the influences within the market is best described by supply and demand laws. According to the supply law, the higher the price, the greater quantity will be supplied. At lower prices, suppliers will not produce as much, but will turn their efforts to other endeavours. On the demand side, it is evident that consumers will increase their demand with decreasing price. As prices increase, buyers tend to decrease the number of units acquired and consumed. A state of price equilibrium exists at the intersection of the supply and demand curves. It is only in this state that both producer and consumer are able to behave in accordance with their plans. Conditions of excess supply or excess demand indicate that the market is in a state of disequilibrium where either the buyer or the seller is frustrated. This frustration generates reactions that tend to push the market toward a state of equilibrium. These laws are visually shown in Figure 20.

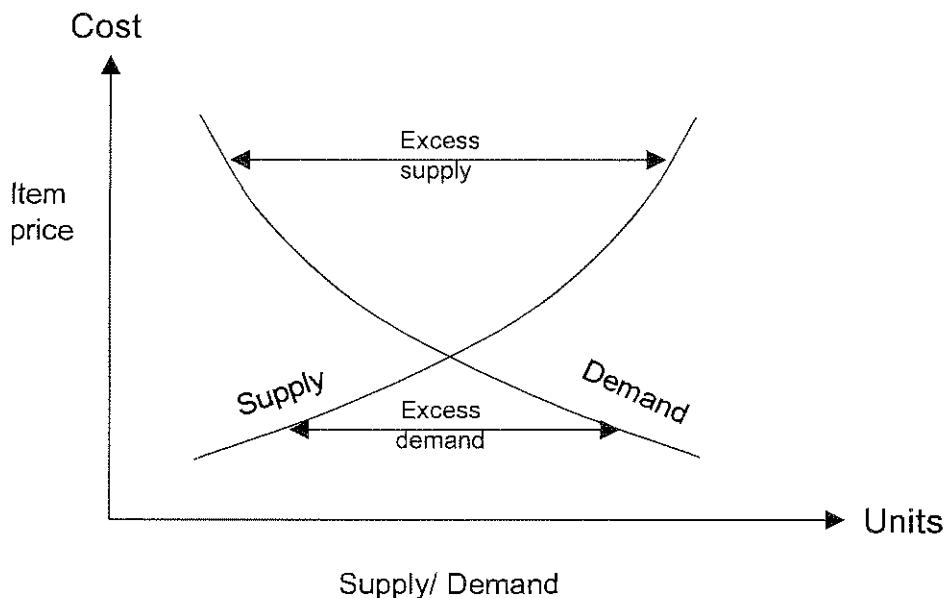


FIGURE 20: SUPPLY AND DEMAND CURVES



According to Fearon *et al.* (1993:639-642) the market structure influences the process in searching for the best prices as it will provide information on how prices are set, whether price concessions are possible and the approach to getting the best price. Banks *et al.* (1987:20-21) mention that there is no completely free mechanism for the determination of price.

They mention the following important aspects influencing the market place:

- ❑ Economic conditions and competitive patterns.
- ❑ The financial standing of the buyer.
- ❑ Fair trade and good business practises.
- ❑ Government statutes and regulation.
- ❑ Patterns of approved conduct by buyer and seller.

All the abovementioned aspects contribute to fairness of trade within markets. According to Churchill & Peter (1998:49) economists distinguish between four different markets, namely:

- ❑ Perfect competition.
- ❑ Monopolistic competition.
- ❑ Oligopoly.
- ❑ Monopoly.

Viljoen (1998:132) indicates that although the abovementioned are the four main market forms, only two broad groups are distinguished, namely perfect and imperfect competition. From the abovementioned, imperfect competition is the collective name for monopolistic competition, oligopoly and monopoly.

4.4.2. Market competitiveness

a. Perfect competition

Perfect competition is a theoretical market form of such a nature that no individual participant (buyer or seller) in the economic process can have any influence on the market price because his or her contribution is too small compared with the market as a whole (Viljoen, 1998:133). Armstrong (1982:xv,10) mentions that perfect competition demands homogenous products so that buyers do not prefer the output of one seller to any other. There are more goods than there are buyers and the marketplace dictates the deal. The



market price is determined by the interaction between demand and supply and all the participants must accept the market price.

A further important characteristic of perfect competition is its impersonal nature in terms of which individual participants act completely independently of one another. Under perfect competition the individual organisation is in pursuit of maximum profit and ignores actions of its competition and will not be influenced by them at all. Perfect competition is therefore a market form characterised by a total lack of competition between individual firms! The buyer merely needs to keep abreast of what is happening in the marketplace, because the marketplace will serve up the best value by the actions of all the buyers. In perfect competition the most important criteria for the buying decision is the quality offering of the product as well as the supplier profile. No external forces dictate purchase preference.

Perfect competition exists if the following conditions are met (Viljoen, 1998:134):

- A large number of buyer and sellers in the market in which each participant is insignificantly small in relation to the market.
- Goods sold are homogenous, making no difference to the buyer from whom he/she buys.
- Production factors (labour, capital, etc.) are mobile and can freely move from one market to another.
- Buyers and sellers have complete knowledge of all market conditions- buyers will always buy from the company selling at the lowest price.
- Total freedom for buyers and sellers to leave and enter the market.
- There exists no government intervention to influence buyers and sellers.
- Each seller acts independently and there is no collusion between sellers.

In perfect competitive markets, buyers have the ability of buying from any supplier, which makes for a high number of possible supply choices.

b. Imperfect competition

According to Nishimura (1992:167), imperfect competition is characterised by strategic interdependence. Under imperfect competition, one firm's optimal price depends on the optimal prices of the other firms. No overpowering forces reside in marketplaces where imperfect competition rule. Therefore neither the buyers nor the sellers are able to dominate in the marketplace; together they will generate a deal.



Nishimura (1992:4-5) primarily blames the existence of price distribution as the reason for inconsistency in perfect competition markets. He mentions two reasons for the existence of imperfect competition:

- *Product differentiation.* Most products produced are of a differentiated nature (even homogenous products) and are sold to customers in differentiated locations.
- *Buyer's information regarding prices and location of sellers.* Should all information about all sellers instantaneously be transmitted to buyers at no cost, competition among sellers will ensure one price for one product. Due to information regularly being unavailable as well as costly, competition does not ensure one price for one product. Some sellers will with high prices make profit through low volumes, whilst other sellers will reduce prices to attract higher volumes and also make profit.

The following paragraphs discuss the various types of imperfect competition.

i) Monopoly

"The price of monopoly is upon every occasion the highest which can be got. The natural price, or the price of free competition, on the contrary, is the lowest which can be taken, not upon every occasion indeed, but for any considerable time together.

(Smith, 1937:61)

A pure monopoly occurs when there is only one manufacturer of a product for which there are no close substitutes. According to Viljoen (1998:157) a monopoly is the opposite of perfect competition having limited number of buyers and sellers (usually only one seller) and the seller fixes the price. Typical examples of monopolies in South Africa are diamond sales by De Beers' Central Selling Organisation (CSO) and South African Breweries' (SAB) production of beer. Viljoen (1998:158-159) distinguish between two types of monopolies:

- *Natural monopolies.* In this case other producers cannot provide the same product as a monopolist because obstacles make it difficult to enter the product market.
- *Artificial monopolies.* The obstacles of entry are not economic of nature and include patents (legal right whereby the holder of the patent has the exclusive right to manufacture a product or use a specific technique or process), licensing or trade secrets (such as the Coca-Cola recipe).



Due to the low impact of demand in the price setting in a monopoly, service and quality are sometimes questionable. Should the supplying company be a monopoly, it could be advisable to the buyer to find a substitute material, redesign the product to eliminate the need to buy from a monopoly, or produce the item in house.

ii) Monopolistic competition

According to Friedman (1983:51) monopolistic competition refers to markets which have large numbers of sellers, but in which the firm produce non-identical (or differentiated) products. Thus each firm has an interval of prices within which it can sell, although the large number of rival firms may cause that interval to be narrow.

Viljoen (1998:194) mentions that monopolistic competitive markets have the following characteristics:

- ❑ Each firm produces a particular differentiated product.
- ❑ Each firm therefore encounters a demand curve for its specific product, and these curves have a downward slope.
- ❑ There are a large number of firms in the industry.
- ❑ There is no restriction on entry (or exit).

A few examples of differentiated products sold by monopolistic competitors in South Africa are the large variety of clothing, wine and furniture. Monopolistic competition is common in the retail and services sector of the economy.

iii) Oligopoly

According to Friedman (1983:1) an oligopoly is a market having few firms (but more than one firm) on the supply side and a very large number of buyers on the demand side. The few firms on the supply side dominate the market, whilst the buyers each make a negligible contribution to the market demand function. Oligopoly is the market structure most commonly found in all the modern economies of the world and was responsible for over 75% of the sales of certain goods in the South African markets during the 1980s.



Vijoen (1998:202) concludes with the following characteristics of an oligopoly:

- There are only a few supplying firms in the market.
- Interdependence and competition are very important.
- Uncertainties in the market create the need for collaboration.
- The product may be homogenous (e.g. cement and aluminium) and is referred to as pure oligopolistic or heterogeneous (e.g. cigarettes and toothpaste) referred to as a differentiated oligopoly.
- Entry to the market is unrestricted, but difficult.
- It has not proved possible to formulate a single, general theory on oligopoly, because the reactions of competitors may differ.

Taking cognisance of the type of competition (especially if it is imperfect) is of utmost importance as it impacts the buying situation severely. Viljoen (1998:132) compares the imperfect market structures in Table 18:

TABLE 18: CHARACTERISTICS OF THE FOUR MAIN MARKET MODELS

Characteristic	Perfect competition	Monopolistic competition	Oligopoly	Monopoly
<i>Number of firms</i>	Very large number	Very large number	Few	Only one
<i>Type of product</i>	Homogenous (identical)	Differentiated	Homogenous or differentiated	Unique without close substitutes
<i>Control over prices</i>	None	Limited	Determined by interdependence	Considerable
<i>Access to the market</i>	Free. No restriction	Free	There may be restrictions	Limited
<i>Nonprice competition</i>	None	Much emphasis on advertising and trademarks	Great, especially in price differentiation	Mostly public relations

From previous chapters, e-procurement solutions favour buying of homogeneous products to that of heterogeneous products predominantly due to the high requirement of manual intervention for heterogeneous products. Therefore e-procurement will best suite perfect competitive and oligopolistic markets.



The type of market will also determine the e-procurement solution of choice. For imperfect competitive markets the monopoly are more likely to control the purchases, while in perfect competitive markets the market controls the purchases. Therefore imperfect competitive markets will favour a solution owned or controlled by the monopoly, while perfect competitive markets will probably favour an independent owned or controlled solution.

4.5. Industry Related Purchasing

Each industry has its own tendency towards certain buying behaviour. Paragraph 4.5 discusses purchasing in the following industries:

- Service Industry
- Not-for-profit Industry
- Manufacturing Industry
- Retail Industry

4.5.1. Purchasing in the Service Industry

As mentioned previously, services are one of the “possible products” that companies are able to “buy”. To enable operations at these companies supplying the service, products also need to be acquired.

According to Parkinson & Baker (1980:9) in addition to buying the necessary range of facilities to supply the service, companies operating in this sector may also be involved in the purchasing of other services.

Due to the market service industries operate in, the products they purchase usually play a significant role in portraying an image to its customers/ potential customers. While these items may generate a less pronounced financial impact than that in the manufacturing arena, their results are no less important. MRO expenditure usually constitute for the highest spending in service industry purchasing. Adequate supplies of properly sized drinking cups, envelopes with accurately placed glue strips and grocery bags in ample amounts are examples of inexpensive items on a unit-cost basis that when missing, send the wrong impression to customers.



Unstable demand of products is what makes purchasing in service companies complex (Fearon *et al.*, 1986:797-798). Short life cycles and a boom-or-bust syndrome are the norms for items typically handled. The usage of these limited-life-cycle items are not based on any past history but rather on market surveys, projections, and estimates, whose accuracy is based on some degree of conjecture.

Due to purchasing not being part of its core business, frequently service industry companies overlook the savings to be made by better controlling this expense. Controlling especially the MRO spending could ensure significant savings in the purchasing cost.

4.5.2. Purchasing in the Not-for-profit Industry

The not for profit sector is extremely diverse, encompassing public, quasi-public and private organisations (Fearon *et al.*, 1993:819-821). Consequently, not for profit purchasing is accomplished through systems which legally mandate stringent policies and procedures.

Similarly to purchasing in the profit-making sector, purchasing in the not-for-profit sector has the objective to identify sources for materials and services and to acquire them when needed as economically as possible. The most important difference is however the stewardship function found in the not-for-profit industry. Purchasing in the not-for-profit industry involves the expenditure of someone else's money to support services and activities that someone else has decided in advance should be provided. For example, whereas the purchasing department in a private-sector firm can restrict bidding opportunities to as few firms as it wishes, a public not-for-profit organisation generally must announce its intention to receive bids or proposals on a particular item and then allow as many firms as desired to submit an offer to do so.

Parkinson & Baker (1986:8-10) mention that in not-for profit organisations, buying decisions are complex due to the little understanding of their motivation and behaviour. Government buying sometimes provide conflict between commercial efficiency and other factors, such as the preservation of employment in a certain area, or a need to develop an indigenous source of supply.

Table 19 discusses the differences between public, quasi-public and private not-for-profit organisations. (Fearon *et al.*, 1993:821-822)

TABLE 19: COMPARING DIFFERENT ORGANISATION TYPES

	Public enterprises	Quasi-public enterprises	Private organisations
<i>Type of organisations included</i>	Federal, and local governments. Also federal hospitals, universities, etc. are included	Public utilities and universities that are state-related but have separate governing boards	Churches, charities, and private schools and universities
<i>Operations</i>	Utilities are subject to operating set by public commissions	Utilities are subject to operating set by public commissions, but have an independent board	Relative independent from governmental control, governed by independent board
<i>Purchasing procedures</i>	Purchasing in highly codified, with formal competitive bidding the choice of determining source and price	It is subject to statutory control and is open to public scrutiny, but is more flexible than public entities	Purchasing affairs are not subject as much to public scrutiny as those of public or quasi-public organisations

Due to the vast array of business type organisations within the not-for-profit arena, it is difficult to specify which exact items are purchased by these different organisations. Parkinson & Baker (1986:8-9) mention that purchases made by these organisations span a wide range of sectors and are made to satisfy a variety of needs, ranging from national interests such as defence, communication, energy and transport, to regional and local concerns with education, housing and health.

According to Fearon *et al.* (1993:822-823) these products are generally available commercially. Obvious exceptions include items such as weapon systems for the Department of Defence, medium and heavy-duty trucks, construction, state-of-the-art research equipment for universities, and certain professional services. Among the items, which account for a large proportion of purchasing expenditures are data processing and telecommunications equipment, food, furniture and pharmaceuticals. Not-for-profit organisations are also turning increasingly to private-sector companies for the provision of a variety of administrative as well as constituency services.



4.5.3. Purchasing in the Manufacturing Industry

The manufacturing companies add value through changing amongst other the physical properties, dimensions, characteristics or application of entities. According to Amrine *et al.* (1987:234) most industries buy material, transport it to the plant, change the material into parts, assemble parts into finished products, and sell and transport the product to the customer. They use raw materials or components to produce either raw materials with different characteristics or end items with new application. An important characteristic of manufacturing companies is their high use of resources such as:

- *Money.* Funds are required to purchase machinery, plant, materials and meet payroll obligations.
- *Equipment.* These “tools for production” can include anything from inspection benches to complex numerical-control machines.
- *Manpower.* No manufacturing facility operates without sufficient manpower and will either contribute physically in the process or control machinery.
- *Materials.* Materials are the input to the manufacturing process.

What makes manufacturing companies different to that of other industries, are that their materials differ in terms of stage of processing as well as their physical properties. Amrine *et al.* (1987:235-236) distinguishes between the following inventory classifications:

- *Raw material.* This includes all items that, after being received at the plant, require additional processing before becoming an identifiable part of the finished product. The finished product of one plant- such as sheet metal- may be the raw material for the next industrial purchaser.
- *Purchased parts.* These are components that need no additional processing before being assembled into a finished product.
- *Finished goods.* This includes all finished products, usually kept at the manufacturer’s premises and is ready for shipment to the customer.
- *Supplies.* This indirect material does not become part of the end product and includes items such as lubrication oils, light bulbs and sweeping compound.

In no other industry is standardisation of product so important as in the manufacturing industry. Manufacturing machinery, finished products and storage facilities are designed around individual components or materials for optimal use and throughput. Unstandardised products or items will therefore have little or no value to the processes in its whole.



According to Parkinson & Baker (1986:7,8) purchases made in the manufacturing industry are due to one of the following reasons:

- For inclusion in the end product, for example raw materials, components, semi-manufactured items, or services such as machining of components
- Capital components used in the manufacture of the end product but not entering directly into it
- Equipment used indirectly in the manufacture or supply of the product, but which is not part of the production process, for example the company's mainframe computer
- Purchasing of services of one kind or another ranging from management consultancy to catering services

MRO (maintenance, repairs and operations), not mentioned by Parkinson and Baker are however also of significance in the manufacturing industry.

4.5.4. Purchasing in the Retail Industry

"I believe that retail merchandising is actually very simple; it consists of 2 factors- customers and goods. If you take good care in the buying of the product, it doesn't come back. If you take good care of your customers, they do come back!"

Fearon *et al.* (1993:764)

According to Hugo *et al.* (2002:136) although the retailer fulfils several marketing functions such as storing, transporting, financing and carrying risk, they are mainly concerned with the re-arrangement (reconstruction) of products. The retailer adds value by providing the right goods at the right time at the right price and in the right quantities. The consumer views the retailer as his "buying agent" and expects him to stock (buy) merchandise that will satisfy the consumer's taste, preferences and needs. Therefore the retailer's success mainly depends on his ability to buy correctly according to the needs of his target market.



Purchasing in the retail sector is broad, ranging from groceries at one end of the spectrum to microcomputers at the other. It is therefore difficult to generalise about retail buying behaviour in general. Parkinson & Baker (1986:8) mention that the facilities, equipment and services purchased are similar in many ways to the purchasing of such items in manufacturing industry, but the products, which are bought for resale, are subject to a wider range of considerations. Table 20 describes the differences between retail and manufacturing purchasing. (Fearon *et al.*, 1993:714-716; Hugo *et al.*, 2002:130-140)

TABLE 20: DIFFERENCES BETWEEN RETAIL- AND PRODUCTION PROCUREMENT

	Retailer	Production
<i>Involvement with operations of firm</i>	Closely involved. Individual store image impacts purchasing	Closely involved. Have to ensure correct items and quantities
<i>Product focus</i>	Focuses primarily on fashion	Focuses primarily on utility
<i>Market demand</i>	Very volatile with very short selling seasons.	Market also experiences surges, but tends to be more constant
<i>Relationship with suppliers</i>	Focus is short term, trying to hold off commitment as long as possible	Longer term relationships with more commitment

It is clear that purchasing is very much involved in the operational aspect of the retailing company (more than in the production company) and will therefore be largely influenced by the following (Hugo *et al.*, 2002:215):

- *Retailer Type.* Retailers can be divided into a number of different store types (such as general retailers, speciality stores, department stores, etc.) each having it's own image and character.
- *Target Market.* The target market can be segmented according to a number of facets, such as the geography, age of the market, income of the market, etc.
- *Product Range.* This includes the scope (number of brand names in stock) and depth (depth in each of the brand names).

In conclusion, e-procurement is valuable for purchasing in each of the industries mentioned. The bulk of the purchases in the service industry are homogeneous products, which has a good fit with e-procurement. e-Procurement will improve control over purchases in the service industry, especially due to the volatility in demand of items procured (characteristic of MRO goods) resulting in a large number of maverick purchases.



The not-for-profit industry is characterised by lower frequency of purchases, each totalling a subsequent value. Purchases are strictly controlled, which can easily hamper the effectiveness of purchasing in the industry. e-Procurement can add value to the MRO purchases (which due to its size will be of significant volume), while the larger more expensive purchases (largely heterogeneous) are probably better suited for an on-line government controlled auction site.

Manufacturers buy frequently, of which the bulk of purchases are direct goods. These goods are bought based on forecasted demand rather than forecasted consumption. For e-procurement to add significant benefit in the manufacturing industry, it should be triggered automatically rather than the current manual order triggering endorsed by e-procurement.

e-Procurement will probably have its least success in the retail environment. Products and vendors frequently change and given the volatility in demand, the retail industry requires a large amount of manual intervention for purchasing. The more fashionable items are, the less it is suited for e-procurement. Due to the wide array of products procured in the retail environment, e-procurement can still be valuable.

4.6. Chapter Conclusion

At the start of the chapter three distinct components influencing the procurement activity were stated, namely actors, activities and resources. In summary the following aspects (or entities) influence the purchasing decision and will have a significant impact on choosing an e-procurement solution:

- *Buyers and suppliers.* Different buyers constellations are formed depending on the purchase at hand, of which aspects such as the buyer's background and demography plays an important role. Suppliers can be situated at different locations in the value chain, forming direct or indirect channels and aspects such as the size of the supply base will also significantly impact the purchasing activity.
- *Channel relationships.* Buyers and suppliers either have cohesive or conflicting relationships in which power is used to manipulate especially prices. They can also be involved in synergetic relationships to improve prices (horizontal co-operation) or to work together (vertical co-operation).
- *Market forces.* Supply and demand laws (which volume will be bought at which price) as well as the market competitiveness (perfect or imperfect) will also impact the purchase.

- *Industry related purchasing.* Different products types are purchased in different industries. The significance of the product types also varies between different industries.

The abovementioned characteristics influence the decision towards an e-procurement solution. Figure 21 summarises the applicability of the above characteristics towards on-line buying or tendency for e-procurement.

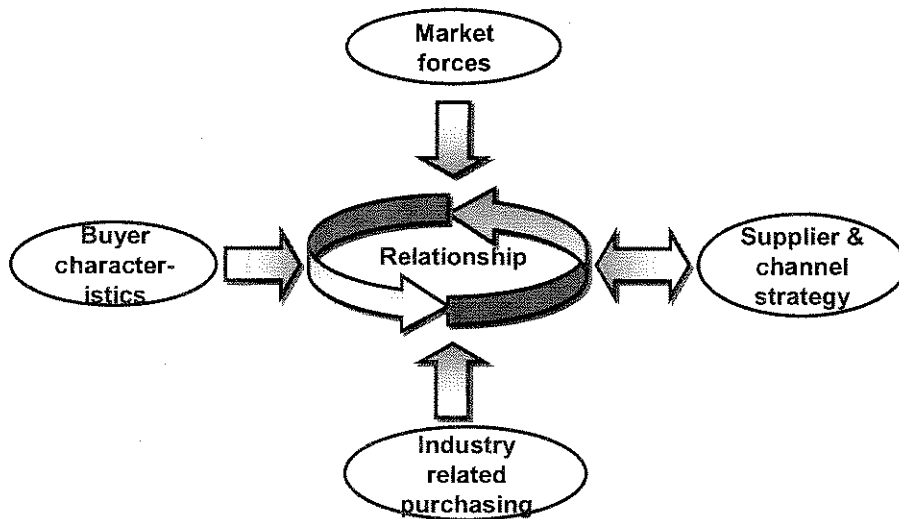


FIGURE 21: ROLE PLAYERS INFLUENCING THE E-PROCUREMENT DECISION

From the above figure it is evident that all the aspects (buyer characteristics, market forces, supplier and channel strategy as well as the industry related purchasing) impact the relationship between the buyer and supplier. The relationship in turn also influences the supplier and channel strategy (The significance of the relationship as well as the value generated for buyers will determine if buyers would seek new relationships to buy similar products). All five the above forces will impact a company's decision to implement an e-procurement solution.



CHAPTER 5

PROCUREMENT LOGISTICS AND SUPPLY CHAIN MANAGEMENT



5. PROCUREMENT LOGISTICS AND SUPPLY CHAIN MANAGEMENT

5.1. Chapter Introduction

As mentioned in a previous chapter, procurement is an all-encompassing term that involves much more than selecting the correct supplier and acquiring the product. Referring to Porter (1985:40-41) different facets of procurement happen in different areas of the company. Inbound and outbound logistics are where these processes meet other companies. Drucker (1995:xi) mentions that organisations make profits where they meet the outside world and inside only generate costs. The profit frontier is where organisations do not simply interface with the end market for their goods, but also where they obtain labour, capital and production materials. Knitting these companies together form a supply chain, which includes all companies from primary manufacturer to end-user.

Saunders (1994:19) mentions that an expanding role for the functioning of the supply chain is being adopted, which emphasises the contribution of managing the whole supply chain rather than independent segments.

According to Porter (1985:11) a firm's success is affected by achieving competitive advantage, either in the form of cost leadership or differentiation. Competitive advantage results from a firm's ability to perform the required activities at a collectively lower cost than rivals, or perform some activities in unique ways that create buyer value and hence allow the firm to command a premium price.

According to Saunders (1994:78) it is possible to adopt a systematic view from the building blocks of individual activities and identify sequences of interdependent activities, which make up a value chain. Many companies perceive the value chain only within the legal boundaries of the firm, where the chain is managed directly by the firm's management hierarchy and planning and control systems. As value is created only on the boundaries of the company, the perspective has to be widened to embrace chains of value creating activities on the supply side, which provide inputs into the internal operations of the firm.

The purpose of the network of value chains might be seen to be to design, produce and deliver products and services which satisfy or exceed the value expectations of customer in competition with other value chains. The value chain perspective recognises that it is not just the activities inside the firm that are relevant to securing a competitive advantage, it involves external activities as well.

According to Saunders (1994:123-124) the primary function of the supply chain is the provision of goods and/or services required by customers and to provide appropriate form, time, place and quantity utilities in the package offered. However the chain also acts as a medium for the exchange of information and the communication of orders or instructions. Also, as well as providing for the flow of goods, it provides a channel for the flow of money from customers, which is the normal reward for the supplier. There is also a fourth object of exchange, which incorporates social values, which are involved in the interpersonal relationships between suppliers and customers.

Waller (1999:10-13) simplifies the supply chain by dividing it in three general sections: i) Inputs, where items are received by the company, ii) Transformation, where the received items are modified according to either use or design requirements, iii) Outputs, where the desired product is finished and distributed to customers. Figure 22 explains this operational supply chain approach visually.

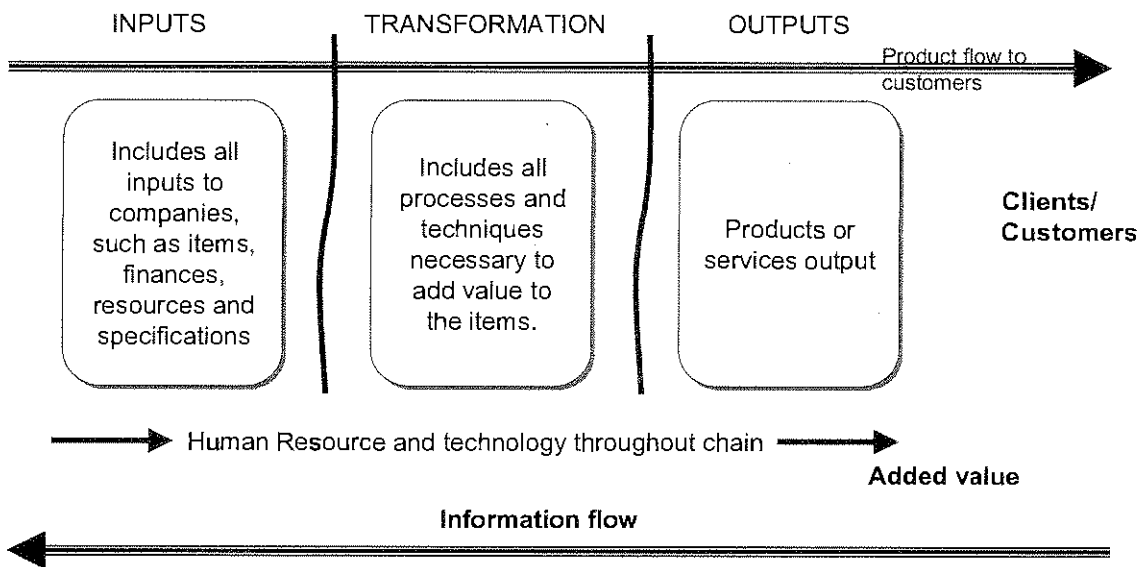


FIGURE 22: OPERATIONAL SUPPLY CHAIN MODEL

Procurement is involved with the acquiring of the correct inputs at the best prices from pre-approved up-stream suppliers. Supplies are then either used as the source for the transformation, or are used internally. Purchasing is an enabling function- enabling the flow of materials and items. Therefore many references refer to purchasing as being part of the large materials handling operations, it operates as the first function within the operation. In developing a framework for e-procurement, it is important to focus on all these aspects effecting purchasing.

The purchasing action is interlinked with a number of supply chain activities, such as across supply chain planning and execution, materials management, inventory control and demand planning.

Chapter 5 focuses on all these aspects, establishing what the modern supply chain consists of and where purchasing fits in. This chapter can be divided as follows:

- *Supply Chain Management (SCM) environmental changes*, which include changes to the value chain, product and service delivery customisation as well as across supply chain planning.
- *Materials Management*, which includes the order and inventory control systems, receiving process, inventory, warehousing and techniques such as economic order quantity (EOQ) and demand forecasting.
- *The right supply chain for products*, which will distinguish between functional and innovative products and the different approach required for managing each one's supply chain.

5.2. SCM Environmental Changes

Syson (1992:83-86) mentions that the supply chain is increasingly recognised as a distinctive challenge to purchase management. The fact that the traditional supply chain crosses organisational boundaries creates conflict and problems. The following problems are worth mentioning:

- *Organisational divisions*. The typical supply chain is under varying ownerships, of which are different legal entities giving rise to payment. Others are functional within the same organisations. It is therefore important that the supply chain is viewed as a whole single entity.

- *Inconsistent policies.* Each separate stage in the supply chain jealously guards its own independence resulting in policies and objectives locally. These policies and objectives are frequently simply out of harmony with that elsewhere along the chain. The classic dilemma of materials management torn between customer, i.e. manufacturing demanding 100% service and finance requiring reduced inventory is well known.
- *Independent control systems.* Each organisation usually has their own system, with limited integration and automated communication with other similar systems in other organisations. The adoption of EDI brought with it the possibility of harmonisation leading eventually to integration between companies.
- *Staged inventories.* The basic underlying assumption of materials requirements planning and of distribution requirements planning is that the fundamental imbalances between marketing and manufacture are irreconcilable and hence must be planned for and managed through inventory. Inventories are seen as a last resort in balancing activities and not as a natural outcome.

All these factors emphasise the importance of an integrated supply chain, working from demand through to supply planning, not only inter- but also intra-company.

5.2.1. Value chain change

According to Normann & Ramirez (1993:70) and Burt & Doyal (1993:9) the traditional thinking about value is grounded in the assumption and the models of an industrial economy. According to this view, every company occupies a position on a value chain. Upstream suppliers provide inputs. The company then adds value to the inputs, before passing them downstream to the next actor in the chain- the customer (whether another business or the final consumer). Seen from this perspective, strategy is primarily the art of positioning a company in the right place on the value chain- the right business, the right products and market segments, the right value adding activities. Today however, this understanding of value is as outmoded as the old assembly line that it resembles and so is the view of strategy that goes with it.

In such a volatile competitive environment, strategy is no longer a matter of positioning a fixed set of activities along a value chain. Increasingly successful companies do not just add value they reinvent it! (Normann & Ramirez, 1993:71)

The new logic of value presents companies with 3 strategic implications:

- In a world where value occurs not in sequential chains but in complex constellations, the goal of business is not so much to make or do something of value for customers as it is to mobilise customers to take advantage of proffered density and create value for themselves.
- A single company rarely provides everything anymore. Instead the most attractive offerings involve customers and suppliers, allies and business partners in new combinations. As a result a company's principal strategic task is the reconfiguration of its relationships and business systems.
- Having the ability to conceive the entire value-creating system and make it work. To go on winning, a company must create a dialogue with its customers in order to repeat this performance over and over again and keep its offerings competitive.

According to Johnson (2001) the importance of supply chains will increase as time passes. According to him supply chains of the future will 'own' the companies, not vice versa.

The new move is away from push (driven by the supplier) to pull systems (driven by the purchaser). Hughes *et al.* (1998:149-151) mention that the following changes in the supply chain has happened:

- *Dematerialisation.* This is the reduction, removal and redeployment of substantial assets invested in traditional sales and marketing.
- *Disintermediation.* Compression in the length of supply chain through the elimination of middlemen in the sales process.
- *Deverticalisation.* Creation of extended enterprises linked manufacturers and inter-industry groups operating within new electronic markets.
- *Data integration.* Real time access, capture and transfer of data between trading partners
- *Development of new products,* which support, sustain and extend electronic commerce

The Internet is changing value chains as it is were known to date. According to Sculley & Woods (1999:21) businesses now has the ability to sell directly to end customers, such as that happened to Dell Computers. This constellation change is shown in Figure 23.

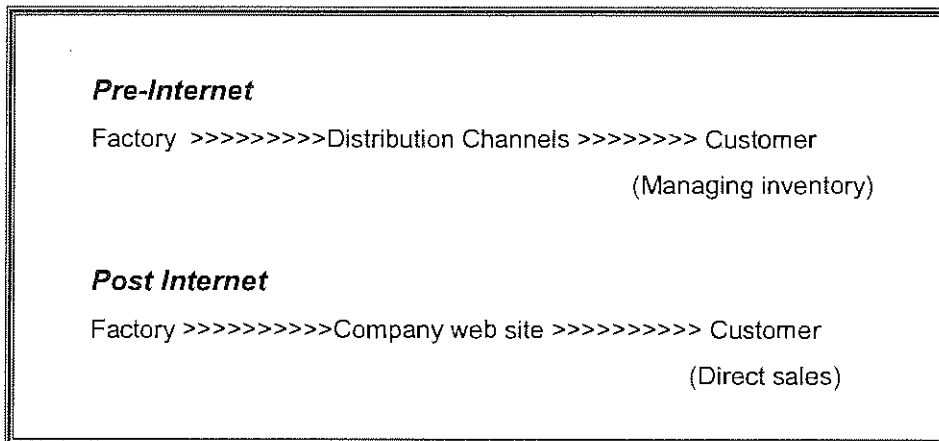


FIGURE 23: CHANGING FROM A PRE- TO POST INTERNET VALUE CHAIN

This approach shown in Figure 23 is however very simplified. The change fuelled by companies such as Dell Computer has created significant after sales complexities, with customers having to endure long response times due to inaccurate stock levels, etc.

Hughes *et al.* (1998:96-98) confirm that supply chains are becoming more customer responsive. Figure 24 depicts the changes that have happened in the past few decades regarding production and supply chain environment.

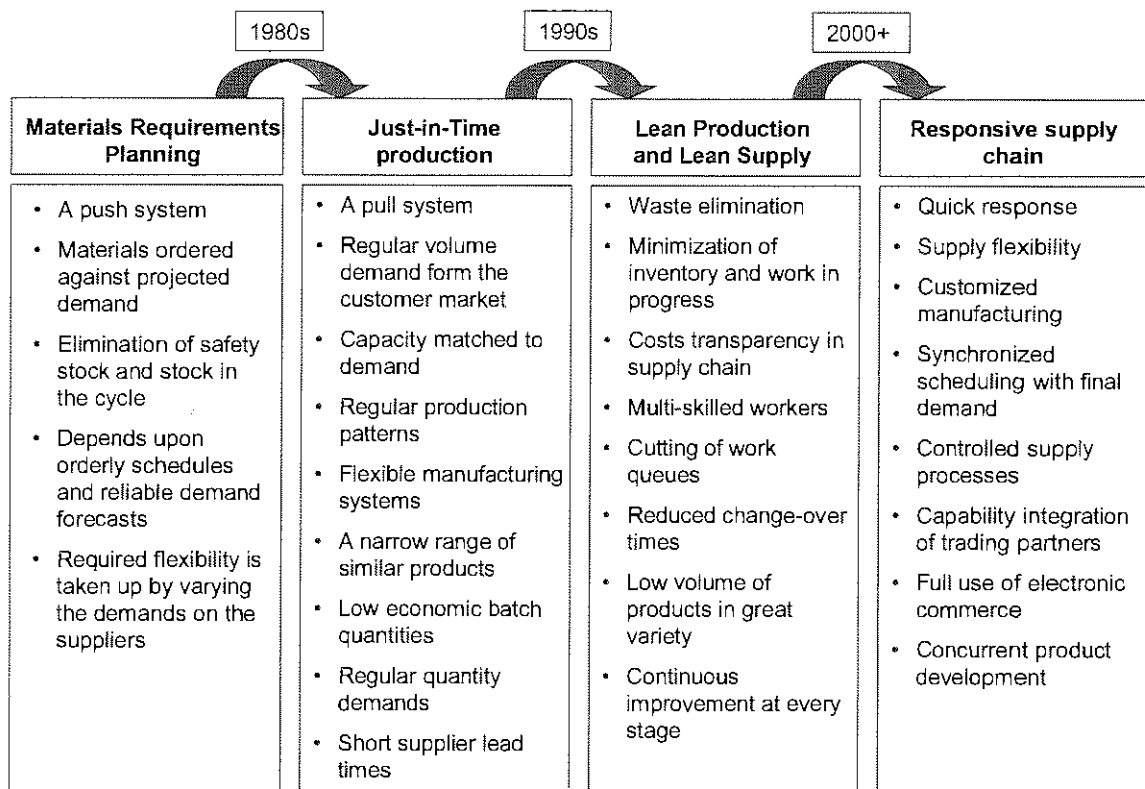


FIGURE 24: INNOVATION IN THE PRODUCTION SUPPLY CHAINS

Clearly from the above the emphasis is now shifting from one of eliminating waste within individual manufacturing entities to eliminating inefficiency from complete supply chains. The focus is increasingly on how companies can most effectively meet the needs of their demanding customers (such as retailers) and the ultra-value conscious end consumer.

Information technology is a critical component of the planning and operation throughout this complex constellation. (Hughes *et al.*, 1998:100) It enables moving from a push to a pull system, utilising various systems such as Point of Sale (found especially in retail), warehouse planning systems, distribution planning and controlling systems and order transmitting software (of which EDI is a good example).

The introduction of this information technology (especially that being operated over the Internet) has however also stirred customer and user expectations to frequently impossible levels. Purchasing in the on-line world happens instantaneously through a few clicks and users expect the same efficient delivery to the point of use.



Korper & Ellis (2001:123-124) mentions that a good Internet supply chain should suit three T's: time, transparency and trust. Order fulfilment should be reliable, open for customer choice (choosing between different items as well as different delivery) and be based on mutual trust (ensuring that transactions are secure)

5.3. Supply Chain Responsiveness and Collaborative Planning

Manufacturers either produce to stock, assemble to order or manufacture to order. The majority of manufacturing companies have always produced to stock, with a limited number focussing in niche markets, manufacturing to order. In between resides assembling to order, which has characteristics of both producing to stock and manufacturing to order. Agrawal *et al.* (2001:62) mentions that for more than two decades, mass customisation has been the future of manufacturing- and for some manufacturers it probably always will be. On the face of it, mass customisation is a remarkably attractive proposition for consumer and producers alike. Consumers get a reasonably priced, tailor-made product reflecting their personal selection of colours, features, functions, and styles. Producers, for their part get to reduce their inventories and manufacturing-overhead costs, to eliminate waste in their supply chains, and to obtain more accurate information about demand.

In both manufacturing to stock and assembling to order, demand to large extent is unknown. Through the Internet companies are able to collaborate with up- and downstream partners and improve planning and forecast demand. Where stock was previously "pushed" downstream, closer working relationships and especially the timely availability of information across the supply chain enables a "pull" of items.

5.3.1. CPFR

The quest for a more customised offering as well as the availability of information through the Internet has spurred a new form of across-company collaboration: that of Collaborative Planning Forecasting and Replenishment (CPFR). CPFR is a concept that allows collaborative processes across the supply chain, using a set of process and technology models that are open (yet allow Secure Communications), is flexible across the industry, is extensible to all supply chain processes and support a broad set of requirements (new data types, interoperability with different DBMS's, etc.).

CPFR is closely tied with similar efforts that have preceded it such as Efficient Consumer Response (ECR), Quick Response and Vendor Managed Inventory (VMI). In providing an environment for dynamic information sharing, CPFR aims to integrate supply and demand side processes (linking manufacturers, retailers and carriers) and effectively plan, forecast, and replenish customer needs through the total supply chain.

Where in the past companies based downstream orders on internal forecasting, CPFR uses communal forecasting and ordering decision involving the downstream supply chain partners (the different forecasts are aggregated centrally and is accessible through the Internet). This makes for a much more accurate forecasting and ordering process. This across supply chain planning and collaboration will benefit both the demand- and supply sides: on the demand side a reduction in safety stock and maverick purchases (due to unknown fulfilment promises), while in the supply side less ordering uncertainty and out of stocks. The impact of such a shift from a push- and pull model is shown in Figure 25 (Agrawal *et al.*, 2001:64).

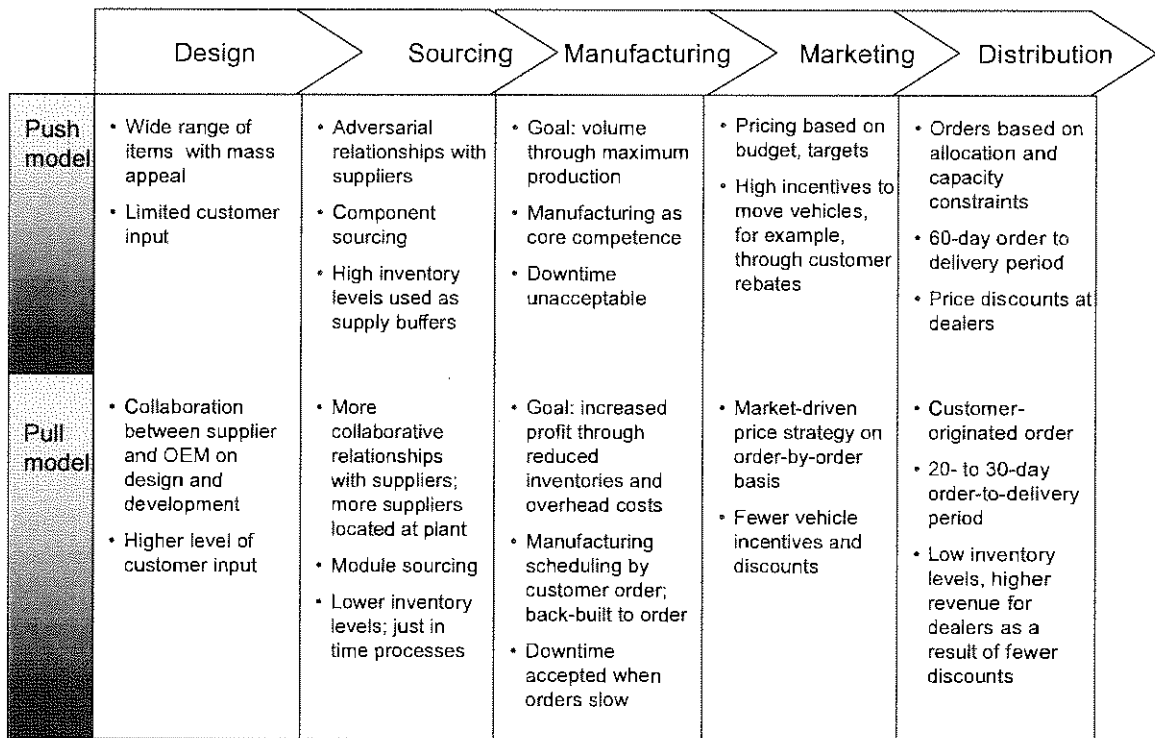


FIGURE 25: CHANGING THE VALUE CHAIN FROM PUSH TO PULL

Fully inter-company integrated e-procurement will require similar visibility and transparency. For effective order lead-time planning, the inventory level at the supplier of the product to be ordered should be visible. Effective CPFR will require an electronic ordering solution, which could be based on collaborated production schedules and manufacturing plans between companies. As demand forecasting and collaborated planning is predominantly applicable to direct materials, a combination of CPFR and e-procurement will be viable in the production arena. This combination will be of substantial value should a “hands-free” e-procurement solution (as discussed in Chapter 2, on page 26) be chosen.

An important part of an effective pull-model strategy is having efficient sourcing in place. Effective sourcing in turn pivots around collaboration between parties across the supply chain as well as having the correct information readily available. Effective sourcing could also result in decreasing inventory levels, which requires Just-In-Time (JIT) processing. E-Procurement will be of value in streamlining a pull-model strategy as it to a large extent automates the purchasing process and provides information that is readily available.

5.4. Materials Management

Materials handling focuses on a large array of inventory management functions, of which purchasing is only one. Chase & Aquilano (1995:697) refers to the American Production and Inventory Society (APICS), which defines materials management as: “The grouping of management functions supporting the complete cycle of material flow, from the purchase and internal control of production materials to the planning and control of work-in-process to the warehousing, shipping and distribution of finished product”.

Leenders & Fearon (1993:53-56) adds to this by mentioning the following functions to be included into materials management:

- *Materials planning and control.* This includes planning of material requirements to meet the broad, overall production plan.
- *Production scheduling.* This is concerned with number of units to be produced, the time intervals over which production will occur, and the availability of materials and machines to produce the number of units specified.
- *Receiving.* This involves the physical handling of incoming shipments, the identification of such material, the verification of quantities and the routing of the material to the place of use or storage.
- *Stores.* This function physically controls and maintains all inventory items.

- *Purchasing.* This is the responsibility of buying kinds and quantities of materials authorised by the requisitions issued by production scheduling, inventory control, engineering, maintenance and all other department or function requiring materials.
- *In-Plant Materials Movement.* This includes all activities involved in moving materials from their point of receipt or storage to the point of usage.
- *Traffic.* This is divided into two activities, namely traffic control (selection of carriers, evaluation of carriers and payment thereof) and traffic analyses (assessing the total cost of transportation and developing techniques for reducing overall transportation costs).
- *Inventory control.* Keeping sufficient supply and the records of the supplies for both direct and indirect materials. Also tracking movement of materials needed for operations, maintenance or production.

This section will specifically focus on the internal operations bordering on purchasing. It will discuss the ordering and inventory control systems, the handling of inventory, receiving and assurance of quality and demand forecasting and EOQ.

5.4.1. Ordering and Inventory Control Systems

Hugo *et al.* (2002:193-194) mention that inventory control is ensuring a sufficient level of stock and satisfying demands regarding quantity, quality, time and place and to control prices. They mention four types of inventory control systems:

- A system with fixed ordering quantities
- A cyclical ordering system
- A JIT approach
- A materials requirement planning (MRP) system

It can be argued that the last two (JIT and MRP) are more management philosophies having implications outside the inventory management arena. Orders can also be generated on end user demand that generally excludes the existence of any inventory control. Each of these five methods will be discussed in the paragraphs following.

a. Fixed order quantities

According to Hugo *et al.* (2002:194-195) the basic characteristic of the system is that whenever stocks are replenished, the same fixed quantity is ordered (the economic order quantity) every time. Figure 26 elucidates this system's functioning.

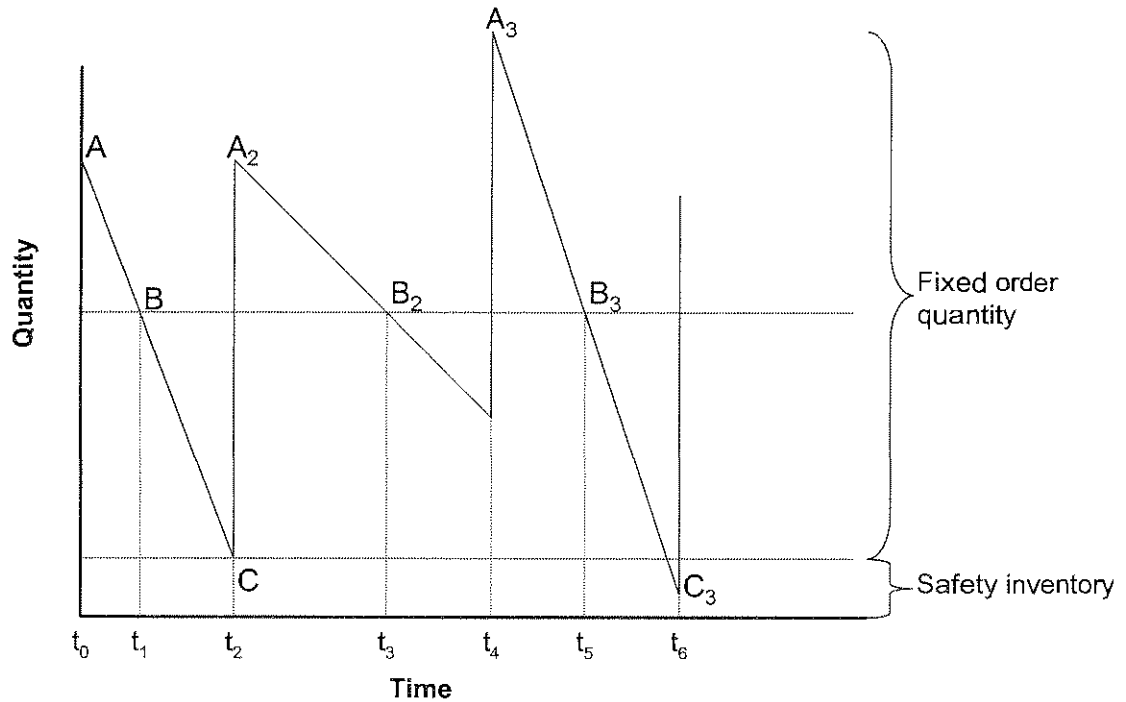


FIGURE 26: FIXED ORDER QUANTITY SYSTEM

Inventory is issued from an existing inventory level (A) and depleted over a period of time up to t_1 , when the reorder level (B) is reached, and further depleted over the period to t_2 , when the safety-inventory level (C) is reached. No safety inventory is issued, because the ordered fixed quantity is received at time t_2 and inventory is replenished to level A_2 . The process repeats itself and a fixed quantity is ordered whenever the reordering level ($B_2; B_3$) is reached.

Important characteristics to remember for the fixed order quantity system is firstly that supplier lead times have to be constant [$(t_2 - t_1) = (t_4 - t_3) = (t_6 - t_5)$] and that the maximum demand within that lead time should be forecasted with reasonable accuracy (should demand be greater than $A_3 - C_3$ insufficient inventory could very well be available).

The system is fairly simple to control and the EOQ is ordered on every occasion. Should the supplier delivery lead-time as well as the tempo of demand vary, insufficient inventory could be available. Also this ordering technique is very antiquated given today's information availability.

b. Cyclical ordering system

According to Hugo *et al.* (2002:195-196) the cyclical ordering system's most prominent characteristic is that the level of all inventory items are reviewed at fixed, predetermined times to determine whether sufficient inventory is available. The review cycles vary according to the nature of the inventory, but longer review cycles require higher maximum (as well as average) inventory levels. Shorter review cycles however mean more orders and higher replenishment costs.

The maximum inventory level has to be calculated for every item, which is a function of the lead-time, length of review cycle (in days or weeks), average demand per time unit and required safety inventory. This results in varying order quantities (difference between inventory level at review period and maximum inventory level) on fixed periods.

Figure 27 is a graphical presentation of the functioning of the cyclical ordering system.

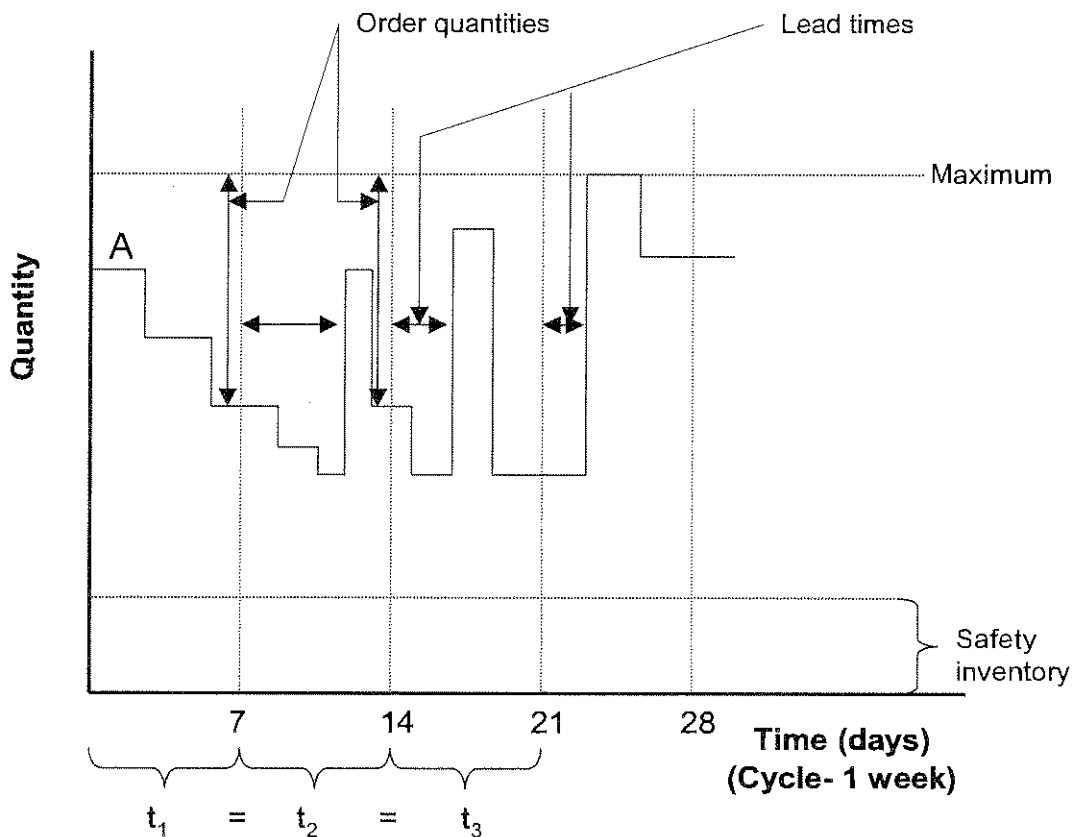


FIGURE 27: CYCLICAL ORDERING SYSTEM

For any of the ordering systems, the inventory holding cost, demand and ordering cost is important. When the demand and inventory holding cost are both low, the cyclical ordering system is preferred. For items with a rather fixed rate of consumption and delivery, the fixed order quantity system is preferred.

c. Just in Time ordering approach

According to Chase & Aquilano (1995: 239-245) Just In Time (JIT) is an integrated set of activities designed to achieve high-volume production using minimal inventories of raw materials, work in process, and finished goods. Clearly JIT involves much more than deriving order frequencies and quantities, but for the purpose of this paragraph only the “ordering” part of JIT will be focussed on.



JIT is based on that need is created by the product being pulled towards the end user, and when it is sold or consumed, a replacement is pulled from the last position in the system (the final assembly in this case). This triggers an order to the factory production line where a worker then pulls another unit from an upstream station in the flow to replace the unit taken, etc.

JIT focuses on eliminating waste as far as possible. It leaves no room for surplus or safety stock as it hides any inefficiencies or waste. To regulate product flow, a Kanban (meaning “sign” or “introduction card”) is used. Usually signal marker/s are used to indicate demand needed downstream.

To further support the elimination of safety inventory, suppliers are required to deliver small quantities very frequently. A further requirement of the philosophy is a stable environment and a repetitive production system, which makes JIT ill equipped for a customised service offering. It also requires close working relationships with suppliers, quick reaction times and short order lead times.

d. MRP systems

According to Chase & Aquilano (1995:16) materials requirement planning (MRP) was a breakthrough production application in the 1970's. Through the existence of a bill of materials (BOM) and the master production schedule (MPS), the system enables production planners to quickly adjust production schedules and inventory purchases to meet changing demands for final products.

As computers and their ability expanded, so did MRP and MRPII was born in the early 1980's. MRPII stands for manufacturing resource planning and integrates the manufacturing company's other resources (particularly the shop floor), accounting and distribution management. When in the early 1990's MRP-II was extended to cover areas like engineering, finance, human resources, project management, etc. (much broader than the previous manufacturing focus of MRP) a new acronym ERP was coined.

Firm customer orders, forecasted demand as well as final product inventory records drive production through the Master Production Schedule (MPS). Through taking the BOM (Bill Of Material), order lead-time, raw material and work in process (WIP) inventory records into account, the MRP-logic plans work orders and purchase orders. The total process is illustrated in Figure 28.

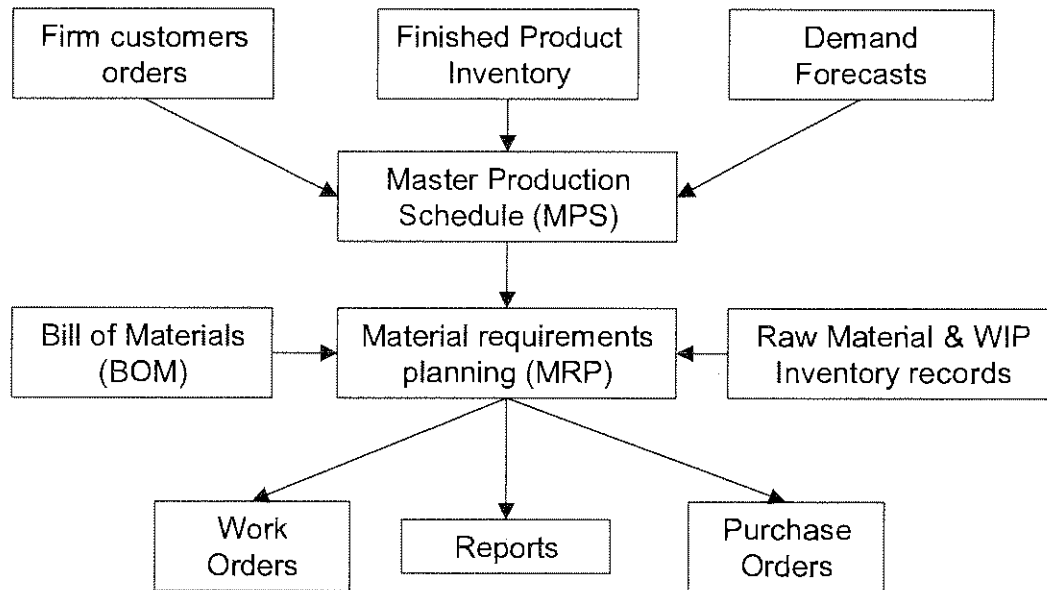


FIGURE 28: THE BASIC MRP LOGIC

According to Shtub (1999:99,100) the MPS serves as a driver combining information on actual orders with forecasts of anticipated demand for independent demand items for each period throughout the planning horizon. This information is compared to stock on hand as well as the BOM to produce scheduled deliveries from the shop floor. The MRP calculation will not only determine work orders to fill gaps between the inventories on hand and forecast/orders, but will also determine what amount of each input material is needed. By taken ordering lead-time into account, purchase orders are generated automatically for the required items at the right point in time.



e. Consumption based ordering

All four the above methods focuses on items used in production. From chapter 3 it is clear that another product type exists, namely indirect goods which are consumed internally and do not form part of any end item. Neither of the above methods does however focus on ordering such items.

Other characteristics of these items include low item value, scattered storage (vs. centralised and controlled storage of the direct items) and frequent as well as maverick purchasing. Most e-procurement systems therefore focus specifically on these items, trying to improve control as well as post purchase information.

f. Comparison between the different inventory and ordering systems

Although all four systems are applied in modern inventory and ordering principles, the use of computer systems have reduced the use of fixed and cyclical ordering systems for direct materials. Modern companies rather base their purchasing requirements on MRP-logic used by ERP systems.

Due to the significant cost implications, some companies still use either of these systems. Should companies wish not to use MRP-logic, the cyclical ordering system is also more suited when the inventory holding cost is very high as well as when many fluctuations exist. When the rates of consumption and delivery are relatively constant, the fixed order system is probably more suited.

Companies opting for electronic procurement will however rather choose between the latter two, namely using MRP-logic or basing ordering on consumption. Basing orders on consumption is driven manually, while using MRP-logic is "hands-free" procurement. If MRP-logic is to be used for purchasing indirect goods it requires information of demand, forecasted demand as well as current inventory levels. The disparate use throughout companies of these items usually complicates centralised storage required to use such logic. If users are however located geographically closely together, centralised storage as well as moving towards electronic procurement based on MRP-logic, will reduce the number of orders as well as order costs.

5.4.2. Receiving and Inspection of Goods

Effective and efficient receiving and inspection of supplier delivery is an integral part of the purchasing process. According to Leenders & Fearon (1993:429) inspection gives the buyer an opportunity to determine whether or not the goods tendered comply with the contract description. Especially in organisations with many users, controlling the quality of deliveries at the entry point into the organisation minimises double handling and unnecessary information and goods flow. In the established purchasing operations, receiving is the place where a company's information flow meets the actual order or goods flow! It is essential that the following happen at the receiving area:

- An order was placed for the product delivered.
- The quantity ordered is on par with the quantity delivered.
- The physical characteristics of the item meet the needs and wants of the end user.

According to Leenders & Fearon (1993:91) the problem with receiving is that quality checking is handled differently by various concerns. Some merchandise is not inspected for quality, some is inspected only through sampling and some is 100% inspected. This could have the effect of more than one area doing inspection, the one only checking arrival (spot check) and the other focussing more on quantity and quality.

The ideal situation is that of no inspection. This is possible because the quality assurance effort cooperatively mounted by the purchaser and the supplier has resulted in outstanding quality performance and reliable supplier-generated records. Since not all organisations have reached this enviable goal, companies have to inspect delivered goods.

According to Leenders & Fearon (1993:163) the purpose of inspection is to assure the buyer that the supplier has delivered an item, which corresponds to the description furnished. There is no point in spending time and money on the development of satisfactory specifications unless adequate provision is made to see that the suppliers live up to these specifications. Inspection can either be done via screening (inspecting each item to determine its quality) and sampling (obtaining a sample representative of the total population tested). Depending on the units inspected and the process of inspection (such as destructive inspection), sampling is regarded as much more economic delivering similar results if randomness and representation of the total sample is obeyed.

e-Procurement itself requires integration into an ERP solution to streamline the receiving operation. Once the products are received (through capturing the delivery note on line) on the system, the ERP solution compares the delivery note to the purchase order and the invoice and if they match forward it for payment. Such automated receiving operations frequently only verifies quantity and excludes ratification of any quality aspects (in most instances this is only verified by the end user). Therefore the total settlement process is dependent on only one of the promised delivery quality aspects. Very few end users will however have the discipline in verifying the quality of the delivery, which will require further intervention by account etc. As e-procurement currently focuses predominantly on indirect purchases, the process cost in following up such deliveries could very well surpass the value of the delivery. Should the e-procurement solution be extended to include the purchasing of direct goods as well, including a second delivery verification could be very necessary.

5.4.3. Inventory and Its Function

Inventories facilitate the smooth, efficient functioning of an enterprise by isolating the individual sections of its operations, thereby decoupling these sections to some extent. Hugo *et al.* (2002:165) identify the following functions for inventory:

- Inventories of purchased materials and components enable the purchasing function to plan and schedule purchases (relatively independently from production) thereby adapting these purchases to the ability of the suppliers.
- Production runs can be planned for optimal usage of equipment and labour without having to consider the risk peculiar to the supply market.
- Inventories consisting of final products decouple the production process from the marketing process, which can contribute to savings through longer production runs.
- Inventories of purchased materials and products as well as inventories of final products protect the enterprise to a certain degree against unexpected price changes in either the supply or the sales market.

The buffer against changes and uncertainty provided by inventory is however very dangerous. Inventory has a serious impact on cash flow and therefore needs to be minimised as far possible. Thompson *et al.* (2000) add that inventory quite often accounts for a major portion of company's investment. Reducing inventory can lower costs and free up finances for other investments. A balance should therefore be struck between adequate customer service levels on the one side and reducing the working capital investment on the other.

Leenders & Fearon (1993:189-193) distinguish between the following types of inventory:

- *Transit or Pipeline Inventory.* These inventories are used to stock the supply and distribution pipelines linking an organisation to its suppliers and customers as well as internal transportation points. They exist because of the need to move material from one point to another and are dependent on location and mode of transport.
- *Cycle Inventories.* These stocks arise because of management's decisions to purchase, produce, or sell in lots rather than individual units or continuously. The size of the lot is a trade-off between the cost of holding inventory and the cost of making more frequent order and/or set-ups.
- *Buffer or uncertainty inventories.* This inventory exists as a result of uncertainties in demand or supply. This inventory give some protection against the uncertainty of supplier performance, due to shutdowns, strikes, lead time variations and late deliveries to and from the supplier.
- *Anticipation or Certainty Inventories.* This inventory is accumulated for a well-defined future need and differ from buffer stock as they are committed in the face of certainty and therefore have less risk attached to them.
- *Decoupling Inventories.* The existence of decoupling inventories at major process linkages points make it possible to carry on activities on each side of the point relatively independent of each other.

Department of Trade and Industry (1997) suggests taking cognisance of the following costs when managing inventory:

- *Carrying costs.* These include all *warehouse* related costs, such as storing costs, staff and handling costs and loss through pilferage and obsolescence.
- *Opportunity costs.* Stock is normally unproductive capital. Carrying it restricts other investments that could have been made with the same capital.
- *Stock-out costs.* In the retail environment, if an item is out of stock it could mean a lost sale. In manufacturing it could mean a halt in operation (shortage of raw materials as well as machine components).

Due to the nature of inventory, an item may serve many of these functions simultaneously. The reason for different classification is in the controllability. To control and properly manage inventory, requires a thorough understanding of both the forms and the function of inventory. Referring to the discussion of innovative and functional products, eliminating inventory is not always the best option. Depending on the product and its utility, it could be that out of stock charges is much higher than that of keeping stock. Also insufficient stock can be very detrimental to customer service in the longer run, making customer rather opt for available competitive products. The optimum inventory levels should however be based on financial calculations taking cognisance of all warehouse costs (including tied up capital and pilferage) as well as out-of-stock charges and its probability.

5.4.4. Warehousing

Warehousing is used for the storage of inventories during all phases of the logistics process. Lambert & Stock (1992:263-265) mention two basic types of inventories can be placed into storage:

- ❑ Raw materials, components and parts (physical supply)
- ❑ Finished goods (physical distribution)

Goods-in-process (also known as work-in-process) inventories are usually kept, but this usually constitutes only a small portion of a company's total inventories.

Figure 29 visually explains the different warehouse applications (Lambert & Stock, 1992:265)

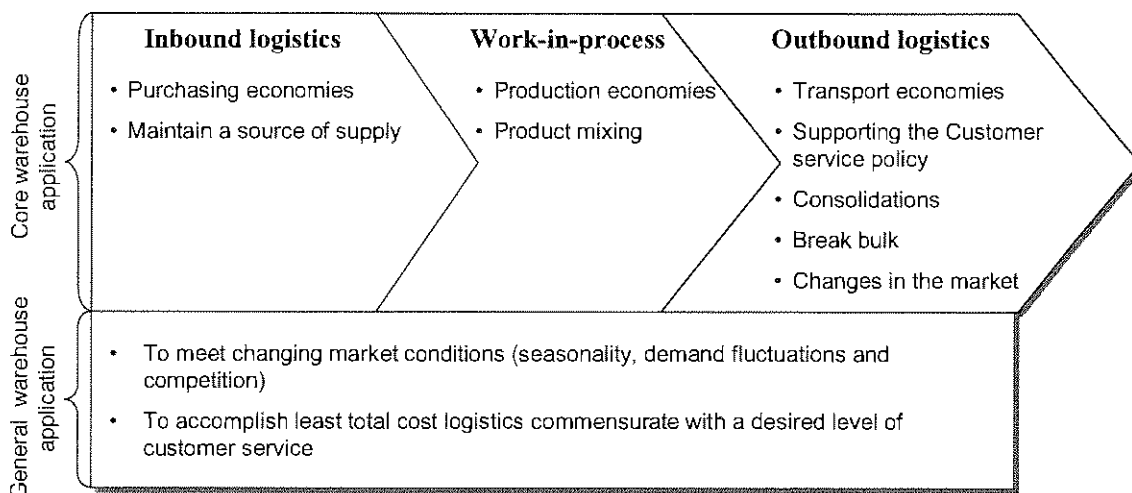


FIGURE 29: WAREHOUSE VALUE-CHAIN

From a purchasing point of view, warehousing is necessary if a company is to take advantage of quantity purchase discounts on raw materials or other products. Not only is the per-unit price lower as a result of the discount, but due to transportation economies the transportation cost will be less. These savings must however be weighed against the added inventory costs that will be incurred as a result of larger inventories. Inventories may also be necessary in order to maintain a source of supply. It may be necessary to hold inventory of items that may be in short supply as a result of damage in transit, vendor stock outs, or a strike against one of the company's suppliers.

The majority of firms utilise warehousing in order to accomplish least total cost logistics at some prescribed level of customer service. The use of warehousing enables management to select the transport modes and inventory levels that, when combined with communication and order processing systems and production alternatives minimise total costs while providing a desired level of customer service.

Warehouse viability and quantity largely depends on the cost associated to the operation. Lambert & Stock (1992:309-311) mention the following four important factors when discussing the number of warehousing facilities necessary:

- *Cost of lost sales*, which would reduce as the number of warehouses increase.
- *Inventory costs*. This obviously increases with the number of facilities, due to the fact that a company usually stocks a minimum amount of all products at every location.
- *Warehousing costs*. This also increases with the increase in number of facilities.
- *Transportation costs*. This initially declines as the number of warehouses increase, but they eventually curve upward if too many facilities are employed due to the combination of inbound and outbound transportation. In general, the use of fewer facilities means bulk shipments from the manufacturer or supplier. After the number of warehouses increase to a certain point, the firm may not be able to ship their products in such large quantities and may have to pay a higher rate to the transportation carrier.

From this it is very clear that all cost involved to the operation should be combined, to determine the most suitable warehouse quantity. Costs however should not be the only consideration, as the following should also be taken cognisance of:

- *Level of customer service required*. If fast and efficient transportation using additional warehouses might be the answer.
- *Purchasing patterns of customers*. If customers order small quantities on a frequent basis, the company will sometime need more warehouses located closer to the marketplace.

- Competitive environment. Should competitors offer rapid delivery to customers, a firm may be forced to match the service level unless it possesses some other differential advantage.
- The use of computer systems. Systems can improve warehouse layout and design, inventory control, shipping and receiving, and the dissemination of information. Martin (1995:194) therefore says with today's electronics, the warehouse should be a switching yard, not a holding yard. The substitution of information for inventories, coupled with more efficient warehouses, tends to reduce the number of warehouses needed to service a company's customers.

De Villiers (1999:30) mentions that centralisation of warehouse capabilities are strengthened by the explosion in information technology. Advantages of centralisation are economies of scale, reduced operational expenses and lower risk in terms of security problems. Disadvantages of centralisation are decreasing customer service levels (customer order will take longer to be fulfilled), vulnerability of the supply chain to natural disasters, industrial actions and supply irregularities. Determining where the warehouse will be located is another difficult issue that requires time and attention. Lambert & Stock (1992:311-318) distinguish between two site selection approaches, namely macro- (examines where to locate the warehouse geographically) and micro perspectives (examines factors that pinpoint specific locations within the larger geographic areas).

In the macro approach, warehouses can be located using either of the following strategies:

- Market positioned, which locates warehouses nearest to the final customer. This approach maximises service levels and enables the firm to utilise transportation economies-from plants or sources to each warehouse location.
- Product positioned, where warehouses are located in close proximity to sources of supply or production facilities. These warehouses generally serve as collection points or mixing facilities for products manufactured at a number of different plants.
- Intermediary positioned. Here the warehouse is placed in the midpoint between the final customer and the producer. A company often follows this strategy if it must offer high customer service levels and it has a varied product offering being produced at several plant locations.

Other macro approaches include product warehouse strategy (where only one product or product grouping is placed in a warehouse), market area warehouse (which positions full line warehouses in specific market territories) and general-purpose warehouse strategy (which carries a full line of products and serves all markets within a geographical market). The adoption of these market strategies largely depends on the width and depth of products and customers.



Greenhut (1982) included factors specific to the company (e.g. environment, security) and profitability elements in the location choice. According to him, the optimal facility location was the one that maximises profits.

5.4.5. Economic order quantity

Hugo *et al.* (1983:174) mention that on the purchasing side, economic ordering quantity (EOQ) is used to plan ordering quantities in such a way that total inventory costs are kept to a minimum. In its most basic form the EOQ formula balances the costs of carrying inventories with the costs of replenishment stock (ordering costs). The rationale behind EOQ is to determine the most economic order quantities. Larger order quantities will result in higher inventory carrying costs (due to larger inventories), but will reduce the number of orders placed and therefore also the costs of replenishing stocks. The deduction can therefore be made that the lowest total cost of inventories occurs at that particular point where inventory ordering costs are equal to inventory carrying costs. The EOQ fundamentals are visually explained in Figure 30.

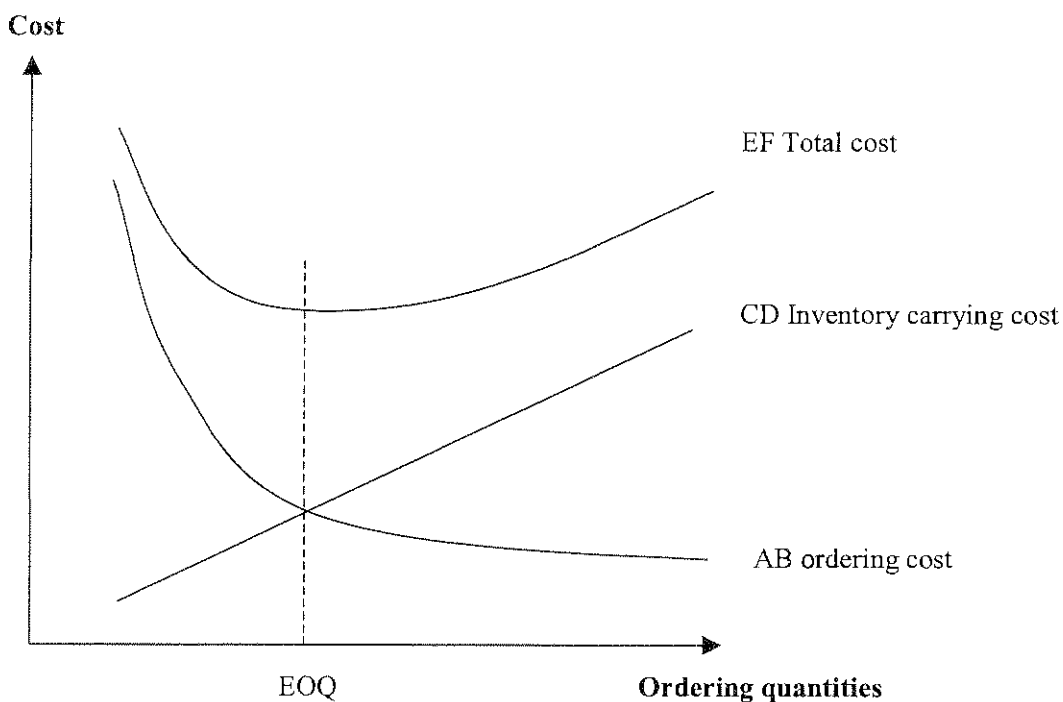


FIGURE 30: ECONOMIC ORDER QUANTITY FUNDAMENTALS

The AB curve represents the reducing cost to order due to fewer and larger orders. The CD curve (inventory carrying cost) rises from left to right as order quantities increase as more inventory has to be carried. The EF curve is the sum of both the AB and CD curves, minimising where the AB curve meets the CD curve. The formula used for determining the EOQ of materials follows:

$$EOQ = \sqrt{\frac{2X(\text{annual use in units}) \times (\text{ordering cost in R/order})}{(\text{unit cost in R}) \times (\text{inventory carrying cost \% p.a.})}$$

The Department of Trade and Industry (1997) suggests using Pareto analysis when determining order quantities. Ordering stationery (MRO) should differ from the way raw materials are ordered. Pareto analysis should assist in determining which stock of “cheap but critical” items will take up the least space and determine with that which items to keep in stock. The expensive parts (usually expensive raw materials) should be stocked in smaller numbers, but will simultaneously consume be the bulk of capital. They suggest using single, inexpensive systems to manage low-value supplies. The more expensive items should be done through re-order points using EOQ systems.



EOQ is however not the whole truth when concerning purchasing. All too frequently the purchasing department purchase bulk orders due to discounts, enabling a reduced cost of acquisition. This bulk order could be the equivalent of a few years' supply- making a large proportion of the stock obsolete due to ageing when eventually needed. The EOQ should therefore encompass the cost of storage, the estimated need per time period as well as the intended future consumption due to market and internal fluctuations. This will ensure that companies are not exposed to large proportions of cash flow being unnecessarily tied up in stock, which become obsolete before use.

5.4.6. Forecasting

"Business, more than any other occupation, is a continual dealing with the future, it is continual calculation, an instinctive exercise in foresight."

Shim (2000:3)

Forecasting is probably one the most important functions in a make-to-stock environment, as it is a starting point for planning. Forecasting has many *raison d'être*s, which includes longer-term financial and environmental forecasts as well as shorter-term production (which includes purchasing) forecasts. Due to the scope of this document there will only be focused on forecasting for purchasing purposes.

Forecasting is basically the method of determining future demand given changes in internal and external factors. The department of Trade and Industry (1997) mentions that better forecasting and more responsive supply chains are the key ingredients in a virtuous circle of improvement in customer service. Good forecasting reduces the need for instantly responsive supply chains: responsive supply chains reduce the need for clairvoyance in forecasts. Together they increase the company's ability to guarantee levels of service. Forecasting represents the manner in which an enterprise seeks to limit the impact of future uncertainty on operations.

According to Lambert & Stock (1992:559-564) forecasting has a twofold rationale:

- Proper logistics system control requires forward planning. Forward planning, in turn, requires goods forecasts.
- It is needed if management is to be able to approximate the future with some reasonable accuracy. It can provide a fairly accurate picture of the future- it is the driving force behind all forward planning activities within the firm.

Hugo *et al.* (2002:176) and Shim (1999:6-7) mention that there are four types of forecasting adding the Markov approach and indirect methods. His total list is the following:

- *Statistical or Qualitative.* These include regression analysis, time series analysis, moving averages and exponential smoothing. Qualitative methods worth mentioning are executive opinions (collective forecasts from different executives in the company about the future), Delphi technique (group technique where experts are questioned about their perceptions of the future), sales force polling (source the forecasts from sales people who are continuously in contact with the customer), consumer surveys and PERT derived (forecast based on optimistic, pessimistic and a most likely estimate) techniques. The most important application of these techniques is determining average inventory requirements per period, trends in inventory requirements, seasonal fluctuations and cyclical movements in inventory demand.
- *External or Quantitative.* This is forecasting based on economic indicators or tangible numbers and can be divided into the following three types:
 - Forecasting based on historical data. This includes moving averages (using the most recent information to calculate an average and forecast the next period), exponential smoothing (uses a weighted moving average of past data for a forecast, giving a larger weight to more recent data), trend analysis (a special form of simple regression in which time is the independent variable) and Box-Jenkins (proposes a time series model, test it statistically, modify and re-test until satisfactory).
 - Associative or casual forecasts. Methods include simple regression (regression analysis using one independent variable), multiple regression (statistical procedure that attempts to assess the relationship between the dependent variable and two or more independent variables), econometric modelling (a method that uses a set of equations intended to be used simultaneously to capture how endogenous and exogenous variables are interrelated).
 - Based on consumer behaviour or Markov approach (analysis the current behaviour of a variable to predict the future behaviour of that proportion of the accounts receivable that will eventually become uncollectible).
 - Indirect method, which includes market surveys, input-output analysis (concerned with the flow of goods among industries in an economy or among branches of a large organisations) and economic indicators.



As qualitative forecasts are very much based on intuitive estimates, Waller (1991:221) suggests being very close to the point of consumption. In the case of products sold to the market (such as the retail industry), it should mean picking up tendencies at the point of sale (POS), whilst if it is for internal consumption, the users and buyers should be closely together. Also qualitative forecasts should be that of more than one person, as an average of the “feeling” of stakeholders will give a more accurate view.

Waller (1999:220-221) mentions that having too optimistic forecasting has the result of unnecessary inventory holding, which may become obsolete. A too pessimistic forecast will have the result of stock outs occurring, resulting in lost orders. A shorter forecasting period usually results in a more accurate forecast. The source of forecasting will predominantly determine the range of forecasting- should it form part of budget, usually more than a year is required. The time range for forward purchasing varies and depends on the item, but will usually be less than three months.

Qualitative forecasts are embedded in modern ERP solutions. External packages are also regularly used, of which Forecast Pro is the current market leader. Clearly forecasting accuracy is crucial to maintaining high levels of customer service and plant utilisation. Poggiolini (2000) mentions that the free flow of information between organisations does away with the need for the supplier to anticipate and forecast, and the supplier is able to operate in a make-to-order environment.

5.5. The Right Supply Chain for the Product

According to Fisher (1997:106) the first step in devising an effective supply-chain strategy is to consider the nature of the demand for the products one's company supplies. The following aspects are important:

- Product life cycle
- Demand predictability
- Product variety
- Market standards for lead times and service (the % of demand filled from in-stock goods)

According to Fisher (1997:109) it is important to match the right type of product to the right type of supply chain. These factors can be used to determine what the ideal supply chain strategy for the specific product is. He distinguishes between the following types of products and supply chains:

- Products*: Functional or innovative.
- Supply Chains*: Efficient or responsive.



5.5.1. Functional and innovative products

Fisher (1997:106) mentions that functional products satisfy basic needs, have predictable demand and long life cycles. Examples include staples and primary groceries bought at retail outlets.

The stable demand of these products invite competition, leading to lower profit margins. To avoid these low margins, many companies introduce innovations in fashion or technology to give customers an additional reason to buy their offerings. Although innovation can enable a company to achieve higher profit margins, the very newness of innovative products makes demand for them unpredictable. Their life cycle is short (just a few months)- because as imitators erode the competitive advantage that innovative products enjoy, companies are forced to introduce a steady stream of newer innovations. The short life cycles and the great variety typical of these products further increase unpredictability.

With their high profit margins and volatile demand, innovative products require a fundamentally different supply chain than stable, low margin functional products do. Due to the volatile demand, products can easily be in excess throughout the supply chain, having the effect that prices have to be marked down to stimulate sales of the excess. The other possibility is having a shortage of stock in the supply chain, resulting in lost sales opportunities and a dissatisfied customer.

The predictable demand of functional products makes market mediation easy because a nearly perfect match between supply and demand can be achieved. Companies that make such products are thus free to focus almost exclusively on minimising physical costs- a crucial goal, given the price sensitivity of most functional products. The uncertain market reaction to innovation increases the risk of shortages or excess supplies. High profit margins and the importance of early sales in establishing market share for new products increase the cost of shortages. And short product life cycles increase the risk of obsolescence and the cost of excess supplies. These market managers should rather focus on market mediation (ensuring that customer receive the correct product mix). Most important in this environment is to read early sales indicators or other market signals and to react quickly during the new product's short life cycle. The critical decisions to be made about inventory and capacity are not about minimising costs but about where in the chain to position inventory and available production capacity in order to hedge against uncertain demand.

Functional and innovative products are compared in Table 21 (Fisher, 1997:107):



TABLE 21: FUNCTIONAL VERSUS INNOVATIVE PRODUCTS

	Functional	Innovative
<i>Aspects of Demand</i>	Predictable demand	Unpredictable Demand
<i>Product life cycle</i>	More than 2 years	3 months to 1 year
<i>Contribution margin (price minus variable cost divided by price)</i>	5% to 20%	20% to 60%
<i>Product variety</i>	Low (10 to 20 variants per category)	High (often millions of variants)
<i>Average margin of error in forecast</i>	10%	40% to 100%
<i>Average stock out rate</i>	1% to 2%	10% to 40%
<i>Average forced end-of-season markdown</i>	0%	10% to 25%
<i>Lead time required for made-to-order products</i>	6 months to 1 year	1 day to 2 weeks

5.5.2. Efficient and responsive supply chain

Due to the differences between functional and innovative products, two types of supply chains can be identified: Efficient and Market-responsive supply chains. (Fisher, 1998:108) Table 22 describes the differences between these different supply chains.

TABLE 22: PHYSICAL EFFICIENT VERSUS MARKET RESPONSIVE SUPPLY CHAINS

	Physically efficient supply chains	Market-responsive supply chains
<i>Primary purpose</i>	Supply predictable demand efficiently at the lowest possible cost	Respond quickly to unpredictable demand to minimise stock outs
<i>Manufacturing focus</i>	Maintain high average utilisation rate	Deploy excess buffer capacity
<i>Inventory strategy</i>	Generate high turns and minimise inventory throughout the chain	Deploy significant buffer stocks of parts of finished goods
<i>Lead-time focus</i>	Shorten lead time as long as it doesn't increase cost	Invest aggressively
<i>Approach to choosing suppliers</i>	Select primarily for cost and quality	Select primary for speed flexibility and quality
<i>Product design strategy</i>	Maximise performance and minimise cost	Through modular design postpone product differentiation as long as possible

Figure 31 correlates the product- and supply chain type.

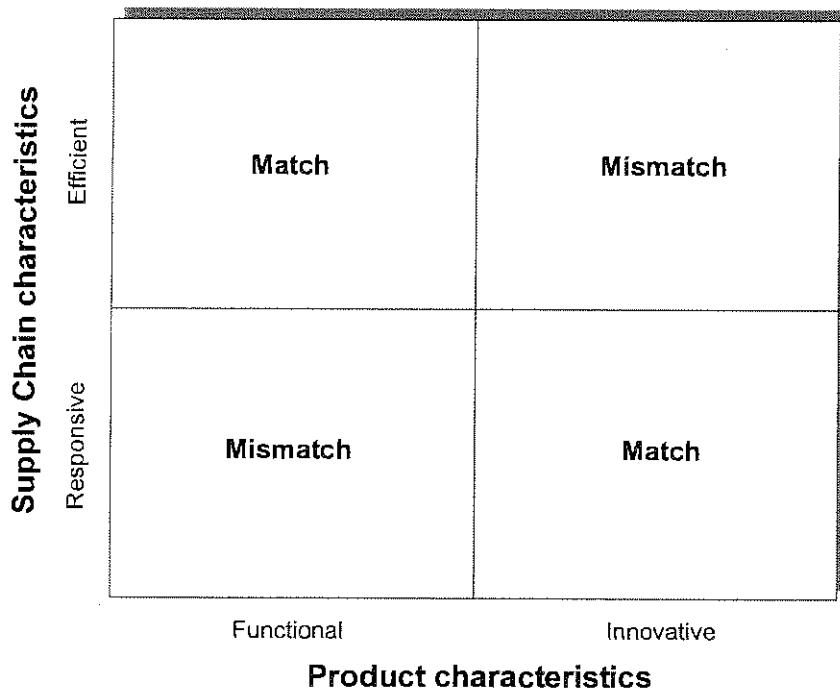


FIGURE 31: MATCHING SUPPLY CHAINS WITH PRODUCT TYPES

According to Fisher (1997:109-110) it frequently happens that an innovative product is delivered through an efficient supply chain. For every dollar such a company invests in increasing its supply chain's responsiveness, it usually will reap a decrease of more than a dollar in the inventory that result from mismatches between supply and demand. Consider a typical innovative product with a contribution margin of 40% and an average stock out rate of 25%. The lost contribution to profit and overhead resulting from stock outs alone is huge- $25\% * 40\% = 10\%$ of sales- an amount that usually exceeds profits before taxes.

The choice of supply chain is therefore very much dependent on the product types and its status. Minimisation of buffer stock is therefore dependent on the product type, not only the expected forecast.



5.6. Chapter Conclusion

This chapter focussed on procurement from a supply chain management (SCM) point of view. The most important of these aspects are across company planning and forecasting (using techniques such as CPFR), inventory control and order origination as well as order receiving.

The Internet has started a rethink of many value chains and the value of each constellation. The logistical complexities associated with especially disintermediation has provided slower than expected adoption in especially the B2B market. Through the Internet companies are able to share information much quicker and cheaper, which has sparked collaborative planning and forecasting (CPFR) efforts. Such efforts enhance supplier response times and reduce out-of-stock situations previously encountered.

From the chapter it is clear that for any form of integrated supply chain planning, forecasting or ordering, sufficient real-time information should be available. The required information include inventory levels, forecast demand and confirmed orders for direct goods.

Direct goods are well suited for “hands-free” procurement where orders are generated automatically. Through the use of an ERP solution (which includes both MRP functionality as well as demand forecasting) demand for end-items are easily determined. For even more effective planning CPFR efforts across company borders are advisable. CPFR efforts can be combined with MRP-logic in the ERP solution and orders can be generated timely.

Indirect goods are less prone to “hands-free” procurement. The demand for the bulk of indirect goods is difficult to project as demand is generated totally inside the company. The products are also used at many destinations, scattered across the company. Many current e-procurement solutions therefore specifically focus on these items in an effort to increase purchasing control and post purchase information. Should automated order generation be considered for indirect goods, it should be coupled with an ERP-type solution. This would require centralised storage and sufficient inventory records, which will only be possible where end-users are geographically located close together. If this is not viable, current cataloguing e-procurement solutions will persist as the most viable solution.



CHAPTER 6

TRADING AND INFORMATION EXCHANGE



6. TRADING AND INFORMATION EXCHANGE

6.1. Chapter Introduction

The choice of information platform (such as the Internet), data format and system specifications are very important when implementing an e-procurement solution. Even in the old-economy procurement process there was a substantial amount of information flowing between the different parties needing to be co-ordinated to ensure accurate and timeous decisions. According to Gadde & Håkansson (1993:146) the effective management of the information exchange between parties may result in lower consumption of resources through a decrease in excess, consumption, loss and waste.

The importance of the information exchanged, is impacted by the properties of the product, the nature of the supplier market and the organisation structure of purchasing. Therefore different types of purchases render different types of information exchange. For instance the purchasing of capital equipment (machinery) will happen infrequently and there will most probably be no established channels of contact for information exchange. Also due to the characteristics of the product and the large investment, extensive information exchange (lots of negotiations) and total life cycle costing should be performed. In contrast the purchasing of MRO happens frequently through established channels. The products bought have homogeneous characteristics and therefore less negotiation will be necessary.

Therefore the correct information and IT related aspects of an appropriate e-procurement solution are vital. This chapter aims to give more insight into the latter. The structure of this chapter is as follows:

- *Information exchange.* Discussing the primary data format, history and comparing their applicability for e-procurement.
- *Information Platform.* The different information platforms for exchanging information (Intranet, Extranet and Internet) will be discussed briefly.
- *System integration and –security.* Focussing on integration with back end systems such as ERP. As integration could include systems in- and outside company boundaries, aspects needed to secure data- and information transmission will be discussed.
- *Business Models:* Different business models and functionalities are implementable through e-procurement. These different business models are compared, with advantages of each for different scenarios will be touched on.



6.2. Information/Data Interchange

The purchasing action has always been characterised by resources exchanging information relevant to the purchase at hand. The level of detail varies between different purchasing situations, but usually the higher the investment (such as capex), the more detail (especially technical) is necessary. Reducing manual intervention throughout this process will incur significant savings.

What complicates this in the e-procurement arena is that different applications are involved each with different information formats and - requirements. According to Thompson *et al.* (2000) data interchange has historically been business rather than technical driven resulting in 'messy' translations. An icon of such systems is Electronic Data Interchange (EDI) where companies were expected to adopt to the exchange (set-up on a Value added Network) format to minimise mistranslation between companies. These standards were usually vertically set-up (each industry had its own set of standards), which made it very difficult for companies to implement EDI across more than one industry.

According to Leon (2001) one of the critical components of B2B integration is deciding which data format to use between systems. Choices range from ASCII files (referred to as the "lowest common denominator") to high-level formats such as EDI or XML. EDI remains one of the most popular formats, despite XML's anointed status as a worthy successor. Korper & Ellis (2001:115) also mention that e-commerce is historically a direct descendent of EDI.

The first part of this section aims to give history of the most promising data exchange formats, namely the different EDI formats and XML. The section will conclude with a comparison between the two different formats, and propose the aspects to consider relating to an e-procurement solution.

6.2.1. EDI

"The global information economy of the future will rest on a global network and EDI will be behind this"

(Nasbitt, 1982:3)

"By the end of the '90s it will be easier to do business without a telephone than without EDI."

(Emmelhainz, 1992:3)



These statements made in the early 1980's and 1990's have proved to be incorrect, but some truth to the statements exist. Electronic Data Interchange (EDI) was established to automate the procurement transaction, doing away with a vast number of staff checking data going into or out of the company. It is a computer-to-computer exchange of business documentation in a machine processable format when EDI started out in the 1960's when justification for EDI was based on savings on postal charges and processing charges. (Parfett, 1992:1-2)

As the value of more open inter-company information exchange is realised, the value of EDI applications increased. Examples such as EPOS (electronic point-of-sale) and ECR (efficient consumer response) adopted in the retail environment are good examples. For these applications that automatically triggered replenishment, it had to be supported by an established B2B order processing system such as EDI. Emmelhainz (1993:12,13) mentions two different types of EDI: (i) Application-to-application EDI that integrates EDI with back-office systems at both the buyer and seller and (ii) Door-to-door EDI where companies are not totally integrated and requires manual intervention for order exchanging. The latter could happen through either limited access at the purchasing company, or at the supplying company (to where orders will then generally be faxed in a hard copy format).

According to Parfett (1992:61) EDI has the following components:

- *Standards*. This is the agreed data structure and electronic communication. The most commonly used EDI standards are EDIFACT and ANSI ASC X 12 standard (usually referred to simply as X12).
- *Software*. It is unlikely that a company will have its data in an agreed format; software is required to translate data into the standard agreed format. The VAN supplier will often offer software, both to make connection to the network and to convert in-house document standards to and from an adopted trade standard.
- *Value added network*. Should the buyer and supplier wish to have application-to-application EDI (refer earlier) a VAN will be required to enable the buyer and seller to be directly linked.



According to Parfett (1992:43-44) developing standards for EDI started as early as the 1970s in the UK. At the same time the USA started their own set of standards (X12), which was not adopted much elsewhere. This situation still left separate standards for Europe and America. The UN-EDI group (UN joint EDI group) was formed, with members drawn from the United States and Europe. They formed an ISO international standard called EDIFACT- Electronic Data Interchange for Administration, Commerce and Transport. Emmelhainz (1993:67-68) mentions that some companies ventured with proprietary systems (in-house grown standards used only for interdepartmental information exchange in large companies), using it to communicate only with the organisation's trading partners on a closed system.

From the above it is clear that trading partners can "belong" to different formats, which complicates electronic transition of information. Value added networks have evolved in the EDI community as a source to resolve the issues resulting from communicating with a number of different trading partners. In essence, what a value added network provides are the EDI communications skills; and the equipment necessary to communicate electronically. The basic function of any value added network is to receive, store and forward electronic messages. In this sense the VAN serves as an electronic mailbox (similar to the electronic mailboxes used for e-mail having the ability to sort messages by receiver, held until the receiver downloads the information). As the establishment and continuous maintenance of a VAN is high, they are only economical through high traffic between relationships and when more than one EDI format is used.

Emmelhainz (1993:106) mentions the following advantages from the use of VANs and the electronic mailbox service:

- *Elimination of communications compatibility problems.* The organisation only has to be compatible with one set of hardware and communications specifications vs. different ones for each trading company. A VAN has the ability to convert data from company-specific format to EDI standard, which allows EDI without changing any internal software.
- *The ability to reach all trading partners with just one call.* The sender calls the value added network, which then calls all the trading partners. Also this dial-up is normally considered as a local call.
- *The ability to receive audit information.* VANs generate an activity log showing what was received from whom and where it went, as well as a log showing what was placed in the company mailbox. This adds to the auditability of the ordering process.
- *The existence of a buffer between your computer and that of your trading partner.* The VAN acts as a buffer between your computer and your trading partners. By using a VAN, you can do EDI but still not have any other computer linked directly with your computer. It also has the ability for secure transmittal through encryption and authentication.



Syson (1992:178) refers to research done by Price Waterhouse suggesting that companies have different reasons for using/ implementing EDI:

- *Small & Medium enterprises use EDI systems because of customer pressure.* Usually limited benefits realise for these enterprises and many do not opt for EDI.
- *Larger companies use it because of its operational benefits.* Should larger companies opt for total integrated solutions, significant cost savings could realise, but inflexibility due to high initial costs is sacrificed.

In conclusion, the Internet incorporates many of the functionality previously provided by VAN's. The Internet has the additional advantage that it is much less costly with wider and easier access to buyers and sellers. The conversion between different data formats is however an aspect to which no final conclusion has been made. Currently eXtensible Mark-up Language (XML) is seen to assist in that arena, which the following paragraph will be elaborated on.

6.2.2. XML

According to Thompson *et al.* (2000) and Korper & Ellis (2001:115) eXtensible Markup Language (XML) is the universal language for structured data on the Web, standardising data description to ease the interchange path. Although it is not per se a business solution, XML can drive cost-efficient, reliable, and open means of communicating between business partners and customers. Companies can leverage existing investments in virtual channel sales, marketing, customer service, and purchasing systems by replacing current and proposed electronic data interface (EDI) systems with XML. Customers have learnt that XML is easier to deploy, is easier to understand, and can be adopted much more rapidly than traditional EDI solutions.

At the simplest level, XML is a way of describing structured data. It is a method of tagging data items so that they will be understandable by all applications. Thompson *et al.* (2000) furthers that XML has a very good capability in describing structured data and there are many instances where structured data forms the major requirement for the purchasing decision. Procurement transactions necessify accurate communication between applications (ability for the second application to read data correctly), which will make XML a force for business use in the future. What XML can bring to the market is a more accessible and flexible standard that is easier to use and implement and which has benefits to both supplying and purchasing organisations in the e-procurement arena, and hopefully beyond.



The initial spin on XML was that there would be schemes available for all business documents. Thus for instance a Purchase Order would have described data elements that would be understandable by all applications. The more practical issues such as how these schemes would come about and who would actually own them was ignored and given little attention. What was initially ignored is that in a similar fashion to EDI, an agreement will have to be reached as to the definition of each data element. XML provides the technical possibility for data description, but it does not solve the business-case issues.

XML will still have an important role to play as a data interchange solution, but is not the 'silver bullet' that is going to cure all of data format's ills previously believed. Thompson *et al.* (2000) mention the following two misconceptions about XML:

- It is seen as an interface between applications, but was not designed for that and will never be implementable as such.
- It will become an EDI-killer. Rather it will force EDI solution providers to consider how they need to re-engineer the EDI business model to fit into a more flexible framework, and also how to leverage the benefits of the Internet.

No unified standard has been decided on and XML is still at an initial development stage within the Internet/business world. The advancements made in the use of related items/technologies such as Style Sheets, indicates that XML, and specifically scheme definitions have a long way to go before a model can be stated with any certainty as the way to proceed. One of the biggest issues with XML is actually that little agreement in structures has been established (currently existing in EDI). Meehan (2001) adds that XML may be the acronym on everyone's lips, but it's still far from being part of many companies' business-to-business trading networks. For some companies XML does not look like a viable solution in their production environment. Companies wavering to adopt XML reason the following:

- Companies having implemented EDI argue that the system already works and do not feel the need to change.
- No universal XML standards exist (similar to EDI's X.12 and EDIFACT) which makes it hard to support.
- XML-based markets have yet to reach critical mass, making value of investments uncertain.



According to Leon (2001) the EDI vs. XML "battle" in the B2B space may be very disappointing, because the choice to use EDI or XML is only a small part of B2B success. At the start of this "battle" it was thought that by replacing EDI with XML would remove major bottlenecks in enabling B2B systems. It was soon realised that using EDI or XML would still result in having to deal with the same issues. EDI is already widely deployed, but has been historically expensive to implement and usually involves a propriety VAN, which limits access.

6.2.3. Comparison between EDI and XML

Although different solutions, EDI and XML have comparative aspects. Table 23 depicts the difference between employing EDI and XML within companies (Thompson *et al.*, 2000; Leon, 2001 and Gattorna & Walters, 1996:5)

TABLE 23: DIFFERENCE BETWEEN EDI AND XML

	EDI	XML
<i>Cost and effort of implementation</i>	Expensive solution to implement making it unachievable for smaller companies (SMEs)	Easy to implement benefiting both small and large companies
<i>Backbone or Information platform</i>	The existence of different data formats necessity the use of VAN's, which does not fit everyone's business model	Uses internet as backbone because it is subset of Standard Generalised Markup Language (SGML)
<i>Integration</i>	Ability to integrate into in-house systems (such as ERP systems), inter company integration and external systems connected to the VAN	Ability to integrate into both in-house, inter company integration and external systems (ASP based, portals, etc.)
<i>Standards</i>	Universal standards such as EDIFACT and X12 have been established	Not universal standards have as yet been established
<i>Benefits</i>	Has operational benefits such as reduced costs (through less manual processing costs and less stock), security and error reduction (due to less manual intervention)	Has operational benefits such as reduced costs (through less manual processing costs and less stock), security and error reduction (due to less manual intervention and Internet provided security)
<i>User adoption</i>	Predominantly by large users with significant volume	Viable for large and small users



In conclusion the real difference boils down to VAN's with the ability to marry different data exchange formats not found in Internet arena currently. On the other hand the Internet provides unlimited access at a fraction of the cost of implementing an EDI solution. While EDI's main function was to automate purchasing transactions between buyers and seller generating significant traffic, an e-procurement solution provides the solution to both high and low traffic "relationships". Also no special software would be necessary for smaller players, who would only have to have access to the Internet.

Where EDI solutions (and often the data format used) were more industry specific, an e-procurement solution could span through different industries. Due to the inexistence of certain aspects of VAN technology currently on the Internet (that marries different formats), the true value of an e-procurement solution would come to light when similar technology is available over the web trading. XML might well be this technology, but a similar situation to EDI could arise where various uniform standards are decided on. Until such time disparate e-procurement solutions will be available and the intended seamless integration only a dream.

6.3. Information Platforms

"Information technology enables today's organisations to integrate supply, production and delivery processes so that operations are triggered by customer orders, not by product plans that push products and services through the value chain. An Integrated system, from customer orders upstream to raw materials suppliers, enables all organisational units along the value chain to realise enormous improvements in cost, quality and response time"

(Kaplan and Norton, 1996:136)

Clearly from the above statement, an electronic platform is necessary for communicating between vendors and buyers. Korper & Ellis (2001:164-167) and Conhaim (1999:5) mention that electronic purchasing in the corporate or business environment works in three ways:

- ❑ *Over the Internet.* Vendors open up "storefronts" and buyers purchase items from them. Included in here is also the ASP applications as well as the B2B exchanges.
- ❑ *Using an intranet.* A company gathers its pre-approved items and vendors on a secure electronic purchasing application and allows authorized employees to order items through the system.



- *Using an extranet*, where several organizations are linked through a proprietary network for the purpose of buying and selling.

Table 24 compares these three information platforms.

TABLE 24: COMPARISON BETWEEN INTERNET, INTRANET, EXTRANET

	Internet	Intranet	Extranet
<i>Description</i>	A network of networks where any one computer can, with permission, get information from any other computer.	A series of networks contained within an enterprise, which may consist of many interlinked LAN's.	A private network that shares part of a business' information with suppliers or vendors. It can be seen as a part of the company's intranet that is extended to users outside the company.
<i>Main reason established</i>	To create a system that would allow users of research computers at different universities to communicate with each other.	The main purpose is to share company information and computing resources among employees of the same company/s.	To give access to a limited number of users outside the company without risking the accessibility over the Internet.
<i>Access</i>	Unlimited access to all users. Password protection is only way to control access.	Only to users within the company.	Only to selected companies/people outside the company.
<i>Security</i>	Numerous securitisation such as encryption, password protection, etc. available. Although security programs are available, it poses the greatest security risk of the three.	Firewalls protect external access, but usually have limited security against internal users.	Network is not totally public, but unlawful access could be a threat by some external users. Requires more security than an Intranet.
<i>System maintenance</i>	Done externally to the company.	Being a local system, will be done internally to the company.	Will be a combination between internal and external resources.
<i>Integration</i>	Difficult, as variety of systems with different data formats.	Should be easy, as all systems are internal to the company.	Could be problematic if a proper VAN is not established.



Especially the Internet and Extranet have introduced significant differences in the way companies interact with their buyers/suppliers as well as how they view internal processes. According to Hagel and Armstrong (1997) the rise of virtual communities in on-line networks has set in motion an unprecedented shift in power from vendors of goods and services to the customer who buys them. Vendors who understand this transfer of power and choose to capitalise on it by organising virtual communities will be richly rewarded with both peerless customer loyalty and impressive economic returns.

6.4. Systems Integration

According to Korper & Ellis (2001:159) it is very important to make sure that e-commerce solutions can easily integrate with existing back-end systems. Back-end systems may include relational databases, transaction-based systems, ERP systems, third-party software, and proprietary systems. The goals of the integration of commerce systems with transaction-based systems are seamless processing of orders and timely, accurate updates.

Yates *et al.* (2000) mention that integration is key in the B2B trading environment. In a survey conducted in the USA, more than 50% of respondents ranked integration as "Extremely Important". Due to the numerous internal systems, companies have to start off with integrating internal applications, before venturing into external integration. Pender (2001) mentions that systems failing to connect inter- and intra company can make electronic marketplaces inefficient, instead of cutting procurement costs, which they are supposed to do.

From an internal integration point of view, the application that certainly will have the most impact on ensuring seamless processing and fulfilment will be that of an ERP solution. The rest of this section will further discuss this.



6.4.1. ERP integration

Enterprise Resource Planning (ERP) has only been around for the past decade and a half. According to Jakovljevic (2001) ERP is the latest phase in over 40 years of evolution of business management techniques and information technology. In the 1960's businesses were dependant on traditional inventory management concepts such as Reorder Point (ROP) and Economic Order Quantity (EOQ). Material Requirements Planning (MRP) followed in the 1970's using Bill of Material (BOM), inventory data and the master production schedule (MPS) to proactively calculate time-phased materials requirements and make recommendations to release or reschedule replenishment order for materials.

Shtub (1999:34-35) distinguishes between three types of information systems built into ERP systems that support the order fulfilment process: i) Transaction processing system, ii) Management Information systems and iii) Decision support system. These systems are elaborated on in Table 25, where the advantages of each type of system for an e-procurement system are discussed.

TABLE 25: ERP INFORMATION SYSTEMS AND ADVANTAGES FOR E-PROCUREMENT

Information systems	Description	Advantages for e-procurement
<i>Transaction processing system</i>	This includes all routine transactions such sales order entry, inventory transactions and shipment to customers.	The integration of an e-procurement systems with an ERP systems will merge automated purchasing transactions with automated accounting, updating of stock levels, order tracking, etc.
<i>Management Information systems</i>	The system does planning, decision making and controlling, by providing the output of automated decision processes as well as routine summaries and exception reports.	E-procurement systems can provide limited information on spend per product/vendor, but lacks information on updated stock levels, unprocessed payments, and exception reporting regarding late deliveries and have the ability to automatically trigger a purchasing request. Integration with an ERP system will ensure integrated production and order management (IPOM), an integrated order fulfilment process that crosses the traditional business boundaries.
<i>Decision support system</i>	The system combines data and analytical models to support semi structured and unstructured decision making.	Integrating an e-procurement with an ERP system will have the ability to assist in some unstructured and non-routine decision making such as identifying overloading resources in the purchasing process.

It is clear that a combination of an e-procurement system with the back up of an ERP system will add enormously towards automating the total ordering and fulfilment process. Figure 32 gives a visual explanation of the contribution of the different systems towards the procurement and fulfilment value chain (both systems impact in the coloured segments, while having no impact in the uncoloured segments).

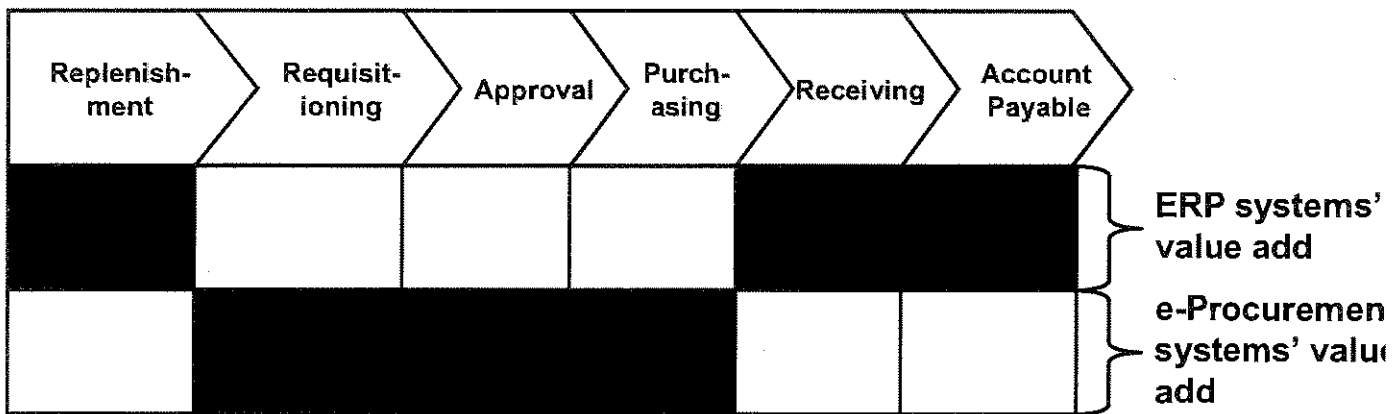


FIGURE 32: ERP AND E-PROCUREMENT VALUE CHAIN CONTRIBUTION

From Figure 32 it is clear that ERP systems assist not only in the fulfilment and payment side, but also through providing replenishment orders (will usually only be for direct material orders).

According to Shtub (1999:99,100) MRP was an early attempt to develop an integrated MIS for the order fulfilment process (combining information on current inventory levels and standing manufacturing and purchasing orders, with technological information about the structure of each product and its manufacturing processes). The output included recommendations on how many units of each product, component, parts or raw material to purchase, to manufacture or to assemble and when to issue the production or purchase orders. These systems evolved to MRP II (or manufacturing resource planning) including capacity planning modules, shop floor control modules, etc. ERP systems followed, designed to support the order fulfilment process of an enterprise operating several factories, warehouses and an integrated logistic system in the supply chain.

The MPS serves as a driver combining information on actual orders with forecasts of anticipated demand for independent demand items for each period throughout the planning horizon. This information is compared to stock on hand as well as the BOM to produce scheduled deliveries from the shop floor. The MRP calculation will not only determine work orders to fill gaps between the inventories on hand and forecast/orders, but will also determine what amount of each input material is needed. ERP systems will by taken ordering lead time into account, automatically generate purchase orders for the required items at the right point in time.



Where ERP focuses on internal harmonisation, the addition of an e-procurement module will boast its ability to extend that functionality intercompany. Where e-procurement currently predominantly focuses on indirect purchasing, ERP's focus is much more on the optimisation of direct material flow. Indirect purchasing is generally consumption based and orders triggered manually. Due to aspects such as forecasting and manufacturing planning, the creation of orders for direct material items necessitates a drive by a backend system (such as an ERP system). The combination of an e-procurement with an ERP system will thus propel the invasion of e-procurement in the direct material procurement arena.

Richardson (2000:56) supports this by mentioning that the next stage will be totally integrated ERP. Exchanging information via the Internet, a company could determine what the inventory level at a vendor is before placing an order. Von Hoffman (2001) mentions that it is not only important to the buyer that inventory levels at the supplier are transparent, but also that the information is updated regularly. It could also in a bidding process place orders to the lowest bidder. This utopian environment is however difficult to achieve. Pender (2001) mentions that systems are usually developed to solve certain problems as opposed to share information with other systems. And for systems to be effective, it should be able not only to connect to other in-house systems, but also to other systems in other companies. Also failure to connect within and between companies could make the establishment of electronic trading inefficient, instead of cutting procurement costs. This seamless exchanging of information over the Internet necessitates the use of a uniform data format (such as XML).

What does however complicate integration with ERP systems is customisation. Most ERP systems installed are customised to a company's needs and likes, but have a tremendous downstream effect on integration. According to Curtiss (2002) many organisations start to implement various systems, without having finished their ERP installations. This has the effect that the information fed is frequently inaccurate and unreliable, resulting in incorrect orders and order volumes!

Many readers may question why established ERP vendors such as SAP, BAAN, PeopleSoft, etc. did initially not expand their functionality to become total integrated companies. Pender (2001) mentions that back end systems (such as ERP vendors) do not always make it in e-commerce and vice versa. Therefore many established ERP vendors initially decided to partner with e-procurement vendors (of which the SAP and CommerceOne relationship is an example), but eventually started their own e-procurement solution.



6.4.2. ASP

In the new economy a new trend has surfaced of outsourcing a service rather than purchasing equipment or having it done in-house. Thompson *et al.* (2000) confirm this by mentioning that more companies are turning to hosted applications and services to solve their business problems. Aspects and processes previously done in-house (especially software functionality) in the organisation can now with little effort be outsourced to a third party. Especially the Internet has removed distance barriers as long as both companies have Internet/Extranet access.

These hosted applications, which are primarily ASP solutions, reduce the need for large internal Web investments, removing the barriers to entry and use of e-procurement facilities. Rutherford (2001) and Berg-Painter (2000) define application service providers (ASPs) as services or applications to companies or individuals that would otherwise have been performed in-house. Especially small companies use ASPs to receive access to applications they cannot afford to deploy an in-house version of. It however also holds value for larger companies as it reduces the capital investment into systems that might not add the perceived value. Also the typical IT support such as complex maintenance, upgrades and retaining the necessary IT skills are the responsibility of the service provider.

ASP's have not been without some market predigest. Some companies do not trust sending highly valuable information across the Internet and could regard their current systems and processes as competitive advantage. Also the integration issue holds true when these systems have to be integrated into existing systems.

Systems previously seen as a company's core competency have also jumped on the ASP bandwagon. MySap.com was developed as an ASP solution for smaller companies that cannot afford a full-fledged ERP implementation, but would like similar functionality. Similarly to normal ERP solutions, integration between the e-procurement and ASP solutions are of utmost importance. What complicates this type of integration however, is the fact that it is a service paid for over the Internet and that the solution can be changed. Therefore a very standardised data interchange format should be used (such as XML) to ensure easier integration with different applications.



6.4.3. Security

Although the Internet is fast becoming the inter company information platform of choice, insecurity has been a significant threat. According to McDonald (1999) when using an inherently open transport medium such as the Internet, it is important to ensure that information is not compromised in transit or in storage. Many security systems are however vulnerable to information loss to their "super users" with high-security administrative capability, which is unacceptable in this day and age.

According to Korper & Ellis (2001:190) security threats have steadily increased from both outside and inside corporate boundaries. Traditionally, 80% of security threats have been generated from within a corporation (employees accessing company systems through loopholes in security). Research conducted in early 1999 by the Computer Security Institute reported that companies report their Internet connection as a frequent point of attack, with incidents rising from 37% of respondents in 1996 to 57% in 1999.

VeriSign (2000) and Korper & Ellis (2001:191-193) mention the following risks of a non-secure Internet site:

- *Spoofing*. It results when a user receives e-mail that appears to have originated from one person but was actually sent by another person. The goal of this spoofing is to trick the user into divulging information or replying with information that is confidential. To prevent it use electronic signatures to exchange authenticated e-mail messages.
- *Port entrance*. Hackers could access the network through specifying a target IP address and scanning for open ports. The resulting information can be used to find loopholes in a security set-up.
- *Password cracking*. Hackers make use of several cracking tools available throughout the Internet, generate and test a series of potential letter and number combinations until they determine the correct password. Companies can prevent password cracking by requiring users to use passwords of at least 8 or more characters that combine alphanumeric elements.
- *Virus intrusion*. Virus exposure results from receiving e-mail, sending documents over the network and even installing software or copying files from another hard drive or diskette.
- *Unauthorised disclosure*. Transactions happening "in the clear" are open to hackers that can intercept transmissions to obtain your customers' sensitive information.
- *Unauthorised action*. Your web site can be altered so that it refuses service to potential customers or malfunctions.



- *Data alteration.* The content of a transaction can be intercepted and altered en route, either maliciously or accidentally- user names, credit card numbers and payment amounts sent "in the clear" are vulnerable to such alteration

The rest of the paragraph will focus on the two aspects necessary in ensuring secure trading:

- i) Securing the access of information or the static systems and
- ii) Securing the information travelling over insecure exchanges (such as the Internet).

A. Securing static systems

Securing systems pivots around one aspect: keeping unwanted users/visitors out of systems/areas in the system. Login names and passwords are of the most common methods of ensuring authentication, because security breaches can be tracked to a central point of contact to (the person logged on to the network). According to Korper & Ellis (2001:206) authentication is used to identify users and programs and to grant access levels according to information on the network. Authentication also assures accountability. Also because activity tracking is a standard tool featured in most corporate intranets and extranets, activity tracking such as file access, modification, and deletions can be set to track according to user login names and passwords.

Another way companies secure company networks from unauthorised external access through the Internet, is through installing the following restrictive systems (Korper & Ellis, 2001:167; McDonald, 1999):

- *Firewalls.* A firewall works at the hardware or software level to control access to the internal system and is often used in conjunction with a proxy server. It interconnects two networks in such a way that packet flow between devices can be restricted to certain paths, or blocked from certain other paths. Firewalls have the advantage to prevent unauthorised logins, block outside traffic from inside your network and filter unwanted network traffic. They can however not protect against traffic that does not flow through the firewall, protect against bad, unrealistic, or nonexistent security policies or protect against viruses.



- *Proxy server.* A proxy server functions as an intermediary between a secure network and a nonsecure network (such as between HTTP requests from a browser, and servers outside the firewall). Most firewall software provides proxy server capabilities. Proxies mask the return address of the requesting computer, providing secure anonymity for users and denying any potential targets. Proxy servers can also assist in the monitoring of information such as access to particular sites on the Internet. This network only contains the systems to be shared by the two companies and uses two firewalls to control access for each company's employees.

Korper & Ellis (2001:168) mention that protecting a company's system requires both firewalls and proxy servers. Firewalls protect the resources of a private network from users of other networks. Proxy servers ensure security, administrative control, and caching service. A proxy server is associated with or part of a gateway server that separates the enterprise network from the outside network and a firewall server that protects the enterprise network from outside intrusion.

B. Securing dynamic information

The second part in making the interchange of information more secure, is securing the physical information involving aspects such as encryption and digital signatures. Korper & Ellis (2001:207) mention that in physical transactions, physical marks (such as seals or signatures) are used for identification and privacy. In electronic transactions, the equivalent of a seal must be coded into the information itself. By checking that the electronic "seal" is present and has not been broken, the recipient can confirm the identity of the message sender and ensure that the message content was not altered in transit. (Verisign, 2001)

Korper & Ellis (2001:203) refer to encryption as the transformation of data to a scrambled form that cannot be read or interpreted without the appropriate translation key. Encryption and decryption require the use of common information, such as a key or key algorithms, to scramble and unscramble data. Encryption and decryption are crucial online, because cryptography is the only practical method of protecting information transmitted electronically. The two encryption methods are compared in Table 26 (Korper & Ellis, 2001:204,205 and Verisign, 2001):

TABLE 26: COMPARISON BETWEEN ENCRYPTION METHODS

Description	Symmetric key encryption	Asymmetric key encryption
<i>Type of cryptography</i>	Single (private) key	Private and public key
<i>Description of functioning</i>	Uses a unique code (or key) for both encrypting and decrypting messages.	Requires two complementary keys to encrypt and decrypt information: a private (used only for encryption) and a public key (only used for decryption).
<i>Advantages/ Disadvantage</i>	<ul style="list-style-type: none"> ❑ Method is only as secure as sender can send the key and trust the receiver. ❑ In large organisations exchanges are cumbersome among multiple parties as it necessitates millions of secret keys. 	The decrypting key is not sent over the Internet, and only the receiving company has access to the decrypting key.

Verisign (2001) concludes that modern cryptographic systems are a hybrid approach combining both public-key and traditional symmetric cryptography. The reason for this is that public-key encryption schemes are computationally intensive versus their symmetric key counterparts. Because symmetric key cryptography is much faster for encrypting bulk data, modern cryptography systems typically use public-key cryptography to solve the key distribution problem first, and then symmetric key cryptography is used to encrypt the bulk data.

An even more advanced method of encryption is that of digital signatures, which replaces the handwritten signature as certification of an individual's identify. It provides information such as proof of origin, proof of submission and proof of delivery to authenticate the author/ sender of a document. Digital signatures are also based on a combination of the traditional idea of data hashing with public-key based encryption. According to Verisign (2001) a digital certificate is an electronic file that uniquely identifies individuals and Web sites on the Internet and enables secure, confidential communications. It associates the name of an entity that participates in a secure transaction (for example, an e-mail address or a web address) with the public key that is used to sign communication with that entity in a cryptographic system.



C. Virtual Private Networks

The greatest attribute to ensure privacy and security is that of a totally private network to which no external users have access. Virtual Private Networks (VPN) are similar to the VANs discussed in EDI to which a limited number (possibly only two) companies have access. According to McDonald (1999) VPNs use hardware or software at client and server locations to create the illusion that members of one network are temporarily members of another. Although an insecure network usually carries the communication supporting this illusion, cryptography keeps the information as private as if the networks were truly connected and isolated.

VPNs are ideal solutions for medium- and long-term business relationships where partners need extensive or unrestricted access to subsets of each other's networks. VPNs are inadequate for rapidly changing and complex relationships (typically short-term relationships) involving business elements such as applications and individuals.

VPNs also have a downside. They are coarse (similarly to firewalls), because when a VPN grants access to a machine that has a needed service on it, all other services on that machine may become vulnerable to inappropriate use. They also require special hardware, software, or both at the client side to enable each client to initiate the specially packaged and encrypted packets that carry the simulated network traffic. Furthermore, clients wishing to participate in more than one business partnership may need to configure one VPN client-side system for each of their potential partners. Finally, VPNs may actually weaken security by their efficiency. Since a VPN makes an external party appear to be a member of the partner corporation's network, simple network security systems may grant that party rights that should only be extended to true members of the network.

No matter which securitisation is used, it needs to secure the systems responsible for carrying the information as well as the information flowing. This decision should be based on the choice of information platform:

- Using an Intranet or the Internet will have the same system security (an Intranet has firewalls to secure access from the Internet). Where these two solutions are however different is that the Intranet will only protect data through using passwords, while encryption will be required for the Internet.
- Should an Extranet be used, the best solution will most probably be the establishment of a VPN. As information is submitted between different companies, data should be protected in a similar fashion to that over the Internet.

6.5. B2B Business Models

Prior to the electronic means of exchanging information (especially over the Internet), most articles purchased by companies were displayed on printed catalogues. Catalogues were found to be an effective means of illustrating attributes of products, giving detail on dimensions, weight, etc. as well as the purchasing price.

Thompson, Jones & Lawson (2001) mention that traditional printed catalogues were designed to promote a vendor's stock to a prospective purchaser, and were created and maintained under the direct control of the seller. However, the rise of databases and the increasing sophistication of interactive technologies have created a scenario where the benefits of hosting a catalogue are equally attractive for the purchaser. Unlike printed catalogues, which are effectively obsolete the moment they leave the printer, the hosted catalogue remains reliable on a 24x7 basis (if maintained effectively). Although cataloguing is very well suited for on-line trade, the Internet has also expanded the trading possibilities by including aspects such as auctions, post and browse communities, etc.

Before discussing the possible on-line solutions, the total B2B trading community need to be sketched. According to Geller (2001), each of the players is really the centre of a star: the buyer deals with many sellers, and the seller deals with many buyers. Therefore **N** number of buyers and **M** number of suppliers create **N.M** possible relations, shown in Figure 33.

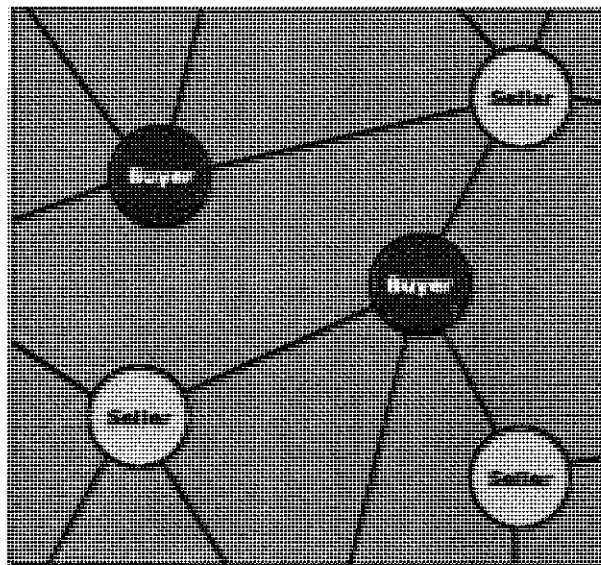


FIGURE 33: THE E-PROCUREMENT SPACE

Therefore the question of where E-procurement happens is neither trivial nor obvious. Berryman *et al.* (1998:129), Welty (2000:42-43) and Thompson, Jones & Lawson (2000) mention three different marketplace solutions for buyers to access suppliers' information on-line:

1. Do it yourself. (Buy-side solution)
2. Have your suppliers do it for you (Sell-side solution)
3. Neutral marketplace (Centralised trading portal owned independently)

Thompson *et al.* (2000) further that the direction in which the solution is facing makes a significant difference to its functionality. Sell-side systems face outwards from the vendor towards the consuming companies, and buy-side systems face out from the purchaser towards its supply chain trading partners. The marketplace resides in the middle, facing outwards to both the buyer and vendor. Buy-side solutions streamline the corporate purchasing process whereas sell-side solutions syndicate vendor product information in order to streamline the transaction processes of the seller. Figure 34 visually represents this discussion.

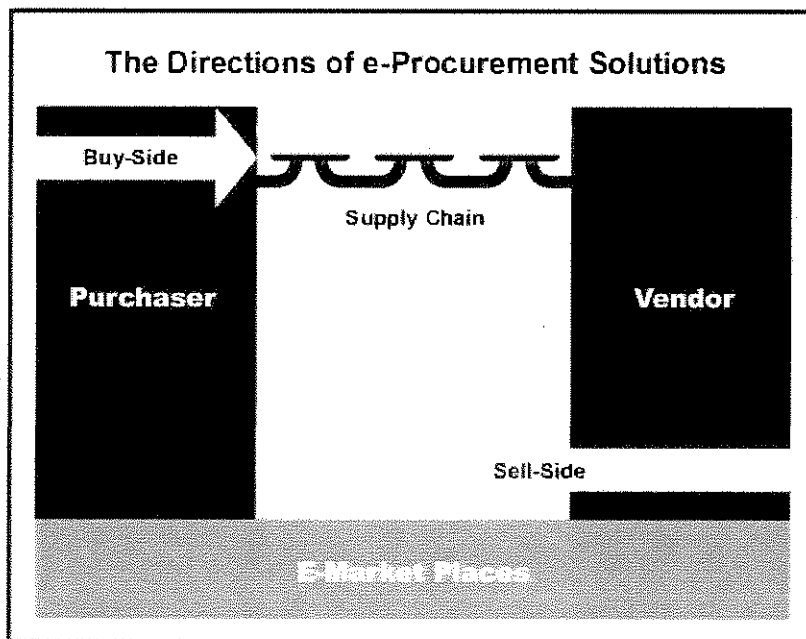


FIGURE 34: BUY- AND SELL-SIDE MARKETPLACES

The following paragraphs further explain each of the three solutions and end of by comparing them to each other.

6.5.1. Sell-side

Geller (2001) compares the sell-side solution to a shopper on Main Street, who visits the various vendors of interest to look at the offerings and prices. The seller mounts software that enables each buyer to browse and purchase products. Each buyer therefore has to visit a number of sell-side offerings to “comparison shop”. The solution is shown in Figure 35.

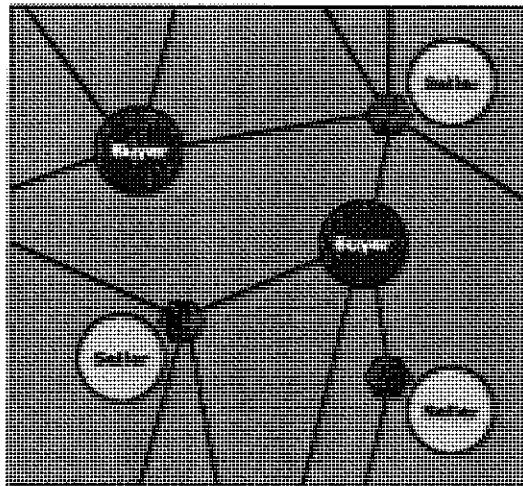


FIGURE 35: SELL-SIDE SOLUTION

Berryman *et al.* (1998:130) mention that vendors set this model up to retain value and market power in any transaction. According to Welty (2000:42) the main advantage is that buyers avoid the headache and investment of reformatting their suppliers' product data themselves. Content-management is totally the problem of the vendor while controlling purchases and comparison-shopping is however very difficult.

6.5.2. Buy-side

Geller (2001) compares the obverse case (the buy-side solution) to a Travelling Salesman where the sellers have to bring their wares to the buyers. The solution is appears in Figure 36.

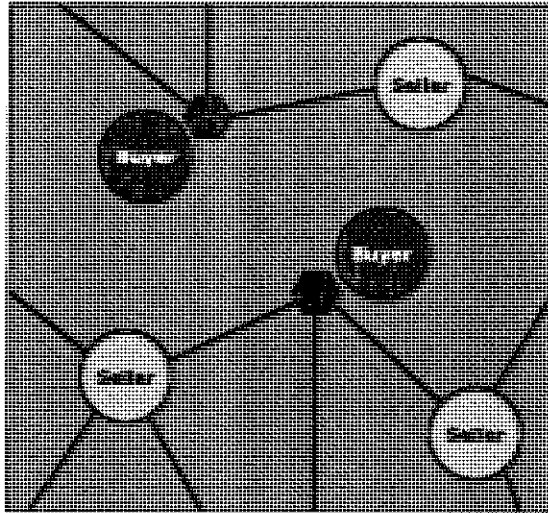


FIGURE 36: BUY-SIDE SOLUTION

Berryman *et al.* (1998:130) and Welty (2000:43) adds that managing the electronic supplier catalogue in-house gives the advantage of control, but requires a full maintenance team to perform content management. Although not shown in

Figure 36, this solution can be hosted by one or more number of buyers (will most probably reside on an extranet).

6.5.3. Marketplace

Geller (2001) and Berryman *et al.* (1998:131) mention that in the e-market place (also referred to as a portal) third parties set up department stores to connect buyers and sellers (and to match many buyers and sellers). Sculley & Woods (1999:18) refer to Goldman Sachs Investment Research which estimates that the vale of transactions conducted on-line through marketplaces between companies will reach \$1.5 trillion in the USA by 2004 in comparison to Forrester Research that estimated that the total B2C on-line commerce in the US will reach just \$108 billion by 2003. This is the most complex of the three models, and is visually shown in Figure 37.

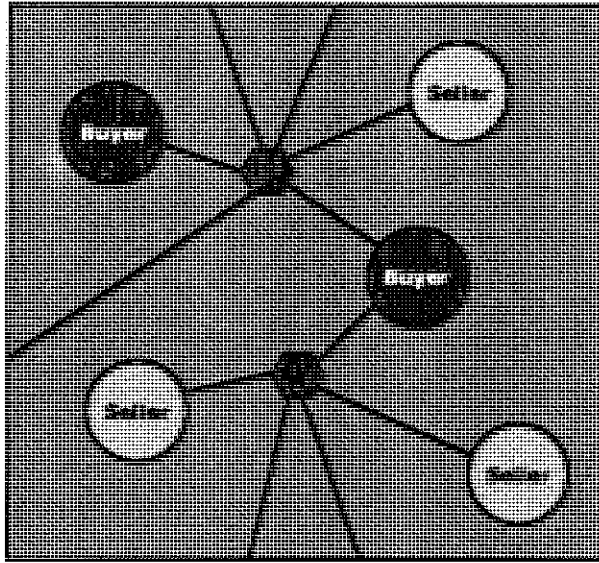


FIGURE 37: MARKETPLACE SOLUTION

According to CommerceOne (2001:b) the marketplace solution started in the B2C realm through sites such as Amazon.com, Yahoo!, Travelocity, and eBay who brought together multiple sellers and services and presented them to the consumer at a single location. This many-to-one-to-many model made it possible for consumers to link to a single portal and gain access to products, services, and information from multiple vendors. These portal sites had the advantage that a wider access would enable more buyers and suppliers to interact. It also eliminated the need to implement multiple platforms to link multiple partners.

The B2B arena took longer to adopt the idea of marketplaces. According to CommerceOne (2001:b) the main reasons are that consumers are far more forgiving than businesses on specifically the following aspects:

- Consumers worry less about real-time availability and pricing
- Supply Chain Management responsibilities faced by business and problems to collaborate with sellers.
- B2C model was limited to very simple, standalone transactions and there was no need to connect with other applications or integrate with other processes. (For business it includes inventory checks, credit checks, purchase order generation, invoicing and approval processes that need to take place before the transaction is complete).



Berryman *et al.* (1998:129) mentions that electronic marketplaces have significant benefit to both buyers and sellers. Sellers can reach customers more effectively, gather better information about them and target them more effectively. Should the marketplace be independently owned, it can earn transactions commissions and fees for value-added services such as information capture and analysis, order and payment processing, etc. The best rewards however go to buyers, who are able to compare products and prices easily and will compel suppliers to compete more fiercely.

Wheatley (2000:S5) emphasises that products best suited for an e-marketplace are those that can easily be compared. Therefore standardised products fit better to a catalogue and are much easier compared to each other. Marketplaces have numerous advantages. One of the main advantages is the reduction in possible relationships (as explained earlier from **N.M** to **N+M**). Another advantage is the reduction in cost if compared to the buy-side or sell-side models. Welty (2000:43) mentions that buying organizations however have to pay a fee for their users to access the electronic marketplace via a seamless integration with their purchasing application, but the subscription costs are far less than half of what it would cost to manage the process themselves. The buying organisations provide their key supplier contacts to their electronic marketplace service, which then works with the suppliers to get their data in electronic form, organize, standardize, store and maintain it, and ensure that it's searchable and transactive.

6.5.4. Comparison between sell-side, buy-side and neutral marketplace models

Thompson *et al.* (2000) mention that all of the three solutions have benefits, especially in the light of saving costs of printing paper-based catalogues. On-line catalogues are however complicated where a business operates at a multi-national level and needs to produce material tailored for use in individual countries. Geller (2001) compares convenience of some important criteria for the three solutions graphically in Figure 38.

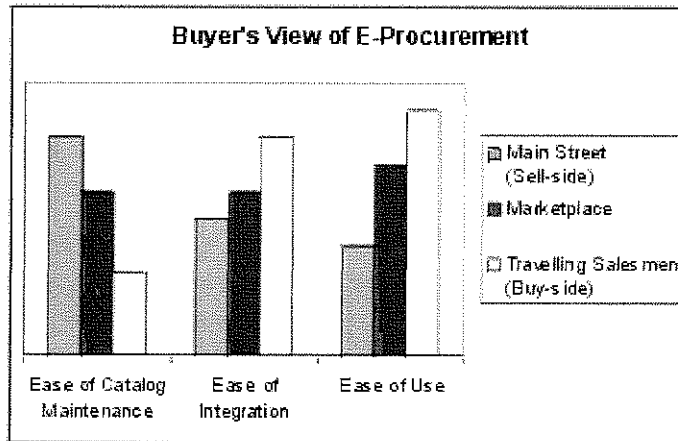


FIGURE 38: COMPARISON OF AN E-PROCUREMENT SOLUTION'S BUYER VIEW

All three criteria show that either the buy-side or sell-side solutions are advantageous for either content management (referred to in Figure 38 as Catalog Maintenance), ease of integration or ease of use. Although the marketplace solution is not the solution of choice in any of the three comparisons, it makes for a very “safe” solution as it performs average in all comparisons. These trade-offs are furthered in Table 27.

TABLE 27: TRADE-OFFS BETWEEN, BUY-SIDE, SELL-SIDE AND MARKETPLACES

Aspect	Buy-side	Sell-side	Marketplace
<i>Content management</i>	The purchasing company builds and maintains catalogues from information received from vendors.	Each vendor erects and maintains their own catalogue. The vendor performs all maintenance.	Build and maintain a single catalogue from information of various vendors. Building and updating catalogues can be a major editorial effort.
<i>Pre-negotiated price</i>	Prices are loaded/updated to what agreed upon between buyer and supplier.	Difficult to obtain, but could accommodate through different login details for each vendor.	Required for effective trading, but is complex when involving large number of buyers and – suppliers.
<i>Control over purchasing</i>	As buying company controls content management, they can exercise tight control over which products on the catalogue and spend per employee per article.	Very difficult to maintain, as vendors need to put in place restrictive policies endorsed by the buying company. Also controlling maverick purchases is nearly impossible.	Purchasing control is dependant on the possibility of exercising log-on control and workflow automation.
<i>Trading platform</i>	Best suited for an Intranet. No access to the Internet is necessary.	Possible on an Extranet, but to ensure easy access the extranet should be accessible via the Internet.	Best suited for the Internet. Where a first party owns the marketplace, it is possible via an Extranet.



Aspect	Buy-side	Sell-side	Marketplace
<i>Ease of integration with back-end systems</i>	Depends on how well processes are automated (especially workflow), but will not be easy.	Will have no back-end integration possibility with the vendor, except if the vendor and buyer is linked via a VAN/VPN.	Currently a unified data exchange method is under investigation, of which XML is the most renowned. In theory purchasing documents will be readable by legacy or ERP systems.
<i>Inconvenience for the buyer's employees</i>	Set-up will be based on buying situations and employee requirements.	Vendors in this space are putting significant effort into making their solutions easy accessible and easily navigational. Employees have to navigate through numerous vendor web sites each with its own interface, packaging and shipping.	In this way purchasing can be brought to the individual desktop and employees have a single interface to deal with.
<i>Largest negative</i>	<ul style="list-style-type: none"> ❑ Buyer requires content management team which can become costly ❑ Continuous liaison with suppliers on prices 	<ul style="list-style-type: none"> ❑ Lack of control over purchasing ❑ Difficulty of comparison shopping 	<ul style="list-style-type: none"> ❑ Solution substitutes a previous stable 1 to 1 solution between vendor and buyer ❑ Some vendors complain that offering through a marketplace commoditises their offering ❑ More than one exchange per industry may complicate buying
<i>Best suited for</i>	Will work best for organizations with a limited number of vendors, where purchasing happens an employee level and strict control over purchasing is necessary.	Will work best for cases of "once-off" purchases where the vendor product is fairly specialized. Also access to purchasing should not be at employee level.	Best suited for larger purchasing organisations that purchases numerous products from various vendors. Is also very well suited for frequent buying, as well as ad hoc purchases (through dynamic pricing modules)

Geller (2001) approximates that due to the cost of catalogue management, pure buy-side solutions will be a rarity in the short-term, accounting for no more than 15% of the total purchasing market. He furthers that the bulk of buying organisations will prefer centralised catalogues and will opt for the marketplace model. He predicts that half of users will do their purchasing through browsers, but that specialized purchasing software installations will sit on at least 30 percent of desktops.



Wheatley (2000:S5) emphasises that products best suited for an e-marketplace are those that can easily be compared. Therefore standardised products fit better to a catalogue and are much easier compared to each other. Berryman *et al.* (1998:134) mention that the product branding and product differentiation should be taken in consideration. Highly differentiated products with very high product awareness tend to be best sold through sell-side solutions (to ensure that branding is not lost through marketplaces or buy-side solutions). Similarly it could be advantageous for a small buying company with few suppliers to host a buy-side solution. The larger both the purchasing amount as well as the number of suppliers become, the more beneficial an exchange becomes.

6.5.5. e-Marketplace focus

Marketplaces have additional aspects that distinguish them from buy-side and sell-side solutions, of which the following are the most prominent: i) their alignment and focus, ii) additional business models not found in the other solutions and iii) ownership. Also marketplace is similar to companies, featuring within a certain industry or across various industries providing services/products needed there. These services/products can be applicable to only one industry (such as specialised chemical equipment) or could pose value to a larger range of industries (such as stationery items). Therefore marketplaces are commonly divided into two distinct types (Eliff, 2001; Geller, 2001; Korper & Ellis, 2001:14-15; McIntyre, 2000:52-53):

- *Vertical marketplaces:* Each industry can be divided into “vertical” market spaces, based on either of the following: i) geography, ii) regulations, iii) product characteristics or iv) even uniqueness of a specific buyer or seller. These markets are industry specific and aim to address products and services specific to the industry. Due to the specialism of these exchanges, they have also developed to cover excess inventory, used equipment, and other items and types of transactions that historically have been particularly inefficient or time consuming.
- *Horisontal marketplaces:* In these trading exchanges a diverse line-up of companies across different industry sectors join forces to streamline buying of common goods and services. Products and services are generic such as MRO goods.

The different marketplace alignments are visually shown in Figure 39.

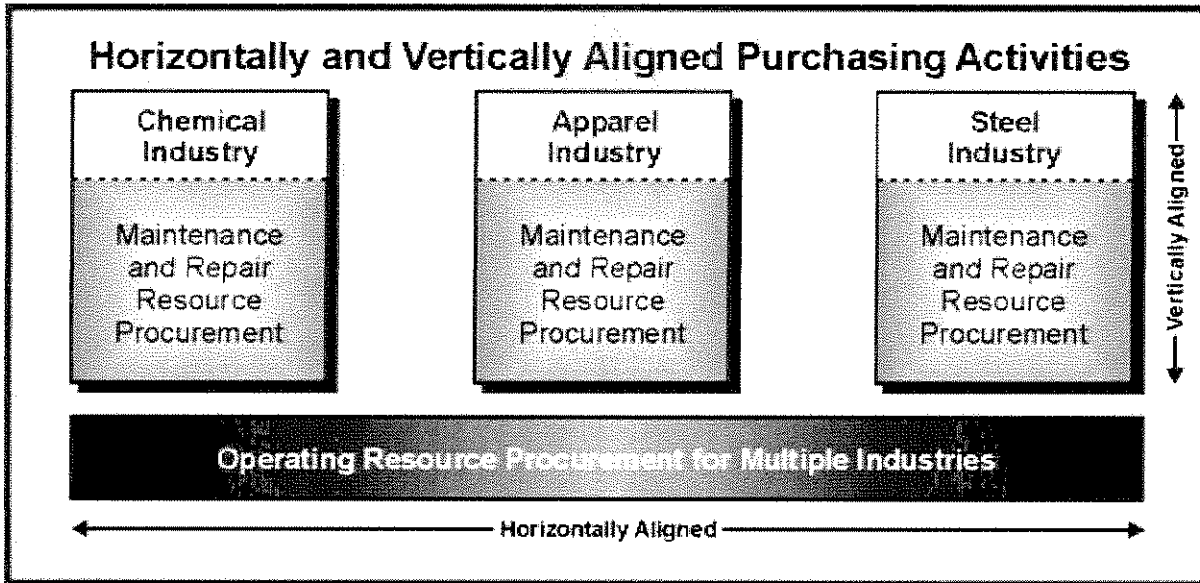


FIGURE 39: VERTICALLY- VS. HORIZONTALLY ALIGNED MARKETPLACES

Ramsdell (2000:176) mentions that a further type of marketplace could establish itself through concentrating functional skills. An example would be in the B2E (Business-to-Employee) through employee self-service. This marketplace type has little application for e-procurement and will not be discussed further.

Korper & Ellis (2000:15) mention that numerous vertical market makers have emerged in highly scattered, highly populated industries such as steel, chemicals, plastics, and paper. This will in time lead to the reduction of existing exchanges and the consolidation of many. Sculley & Woods (1999:95) support this sentiment mentioning that in the long-term the market will not sustain a profusion of near-identical e-marketplaces.

a. Marketplace business models

Aside from aggregators (also known as cataloguing and described in paragraph 6.5.3 on page 168), marketplaces pose a number of additional business models. According to Kafka *et al.* (2000:b) and Sculley & Woods (1999:57-59) the following additional possibilities exist:

- *Auctions*. Revolutionary pricing is used in that each transaction is negotiated where multiple buyers and sellers bid competitively for contracts. Bidding mechanisms include the Dutch-, English-, Japanese-, Sealed-bid first price-, Sealed-bid second price- and reverse auction (refer
- Figure 6 on page 31 for a detailed description of each). These different bidding types however boil down to the following auction types:



- i. *Seller driven*. This uses normal "upward" pricing bids to increase the price as time passes. This is less favourable to buyers as it only provides a competition between buyers, but favours the liquidation of surplus goods.
 - ii. *Buyer driven*. This uses downward pricing bids that reduces the price of an item as time passes. The approach favours buyers, especially where there are multiple sellers. This is normally adopted by horizontal trading hubs where suppliers remain anonymous to one another, but with the advantage that they can see the competing bids in real time.
 - iii. *Dynamic auto execution systems*. Here bidding between buyers and sellers happen automatically and is continuously two-way. The aim is to obtain the best price for both the buyer and the seller. This system only works for standardised/commoditised products with a high liquidity.
- *Trading hubs*. Buyer and seller communities are created for multiple verticals that have not yet embraced the Internet themselves in a specific exchange. Sellers are given virtual storefronts to advertise their products and buyers are attracted by news, product specification information, product reviews and product recommendations. They can be horizontal (support buyers and sellers in many different industries) or diagonal (specialise in supporting a specific type of buyer or seller) or a specific type of product category across multiple industries.
 - *"Post and browse"*. Is a sophisticated Bulletin Board where buyers and sellers can post expressions of interest to buy or sell. After meeting through the postings a deal is made. This model is the ideal mechanism for very fragmented markets with non-standardised products- each contract is quite unique and requires one-to-one negotiation.
 - *Exchanges*. Exchanges are the broadest of the models, in that a centralised market for standardised (or commodity-like) products is created. This includes competitive bidding between multiple buyers and sellers with automated matching of orders, creating an efficient price-setting mechanism. Here trading systems allow users to factor in a whole range of variable items on which the wish to seek satisfaction in addition to price and quantity (such as quality, delivery time, cost of delivery, etc.). It will probably use "fuzzy" logic based on network technology.

Table 28 compares the abovementioned models in terms of its pricing model. (Eliff, 2000; Korper & Ellis, 2000:57-59; Sculley & Woods, 1999:15-19)

TABLE 28: BUSINESS MODELS AND TRADING MECHANISM COMBINATION

Business model	Main function	Trading/Pricing mechanism
<i>Aggregators</i>	<ul style="list-style-type: none"> ❑ To compile inventory from as many suppliers as possible and spur demand for inventory from as many buyers as possible. ❑ Due to the rigidity it works best for low-value items priced frequently, but in small quantities. 	Fixed prices. Moving towards auctions.
<i>Post and browse</i>	Are industry-specific and bring together organisations with alike interests. Their goal is to attract a target audience of potential buyers for industry sellers.	Individual deals. One on one negotiated terms and prices.
<i>Auction markets</i>	To provide a venue for the purchase and sale of especially ad hoc purchases, but is moving towards contract bidding. Examples included surplus inventory, used capital equipment, discontinued goods, and perishable or refurbished items. To be effective, significant volume need to be leveraged to gain attention and price discounts from the market.	Dynamic pricing. Seller-driven and buyer-driven auctions.
<i>Trading hubs</i>	Sellers are given virtual storefronts to advertise their products and buyers are attracted by news, product specification information, product reviews and product recommendations. Is the basis from which exchanges were developed but is more rigid than exchanges.	Fixed prices and some buyer-driven auctions.
<i>Fully-automated exchanges</i>	Brings together multiple buyers and sellers in one central market space and enables them to buy and sell from each other at a dynamic price, which is determined in accordance with the rules of the exchange. Supports an analytical approach, as post-trade information is available.	Dynamic pricing. Automated matching of orders and continuous auction markets.

From the above discussion it is clear that fully automated exchanges hold the most advantages. Kafka *et al.* (2000:b) confirm this by indicating that models such as auctions and exchanges will reach \$746 billion in turnover by 2004! Exchanges also combine most of the advantages of the other business models. Thompson *et al.* (2000) support this by stating that the market trend is towards the use of portals, and most markedly towards e-marketplaces and trading hubs (exchanges) that facilitate virtually every buying need. They further that such models should not only well support transactional buying (automation of the purchasing action) but also support and enable strategic procurement activities (contract negotiation and price determination).



Elliff (2000) furthers that exchanges initially focused mostly on indirect materials and support services. However, there has been a rapid expansion of categories that are covered, and now just about anything a business needs, including critical raw materials, components, subassemblies, and even basic commodities such as fuel and agricultural products can be bought using horizontal or vertical exchanges.

D. Membership and ownership

The ownership of a marketplace to a large degree determines membership and access to it. Thompson *et al.* (2000) mention that besides being either vertical or horizontal, marketplaces can either be buyer-owned or neutral. Per definition an exchange has multiple buyers and sellers and through their interaction in commerce, critical mass is achieved.

While these "buyer-centric" exchanges can with no doubt be effective, there is a growing concern among suppliers that their purpose is not to broaden the pool of suppliers but to enable the biggest corporate buyers to exert their combined clout over their smaller suppliers and extract lower and lower prices. On the other hand Sculley & Woods (1999:65) mention that should a marketplace be independent, it needs to partner with key suppliers, commerce communities and information providers. These strategic partnerships will help the marketplace to scale up and achieve critical mass quicker.

Table 29 shows four membership and ownership structures for marketplaces, as well as the advantages and disadvantages of each. (Sculley & Woods, 1999:61-70).

TABLE 29: COMPARING MEMBERSHIP AND OWNERSHIP MODELS

Structure	Advantage	Disadvantage
<i>Owned by one group of users exclusively</i>	<ul style="list-style-type: none"> □ Can design the market to their own particular advantage and profit □ Can restrict membership through restricting "seats" 	<ul style="list-style-type: none"> □ All other user groups may be disadvantaged by the owners' anti-competitive practises. □ "Set-up" may not fit the needs of the rest of the market.
<i>Owned by multiple users- open membership</i>	It has the ability to balance the competing interest of each user group.	It can take a long time to get all these potentially disparate groups to work together.
<i>Owned by one or more benign commercial investors</i>	<ul style="list-style-type: none"> □ It is run totally commercial (for a profit) and non discriminatory. □ It is the most prevalent model in the past couple of years. 	As this model does not specifically partner with an industry leader, it could have limited liquidity and interest from the market.
<i>Owned by the government</i>	It may grant the exchange a statutory monopoly by which it can remove competitive treats in that jurisdiction.	The marketplace may not remain competitive especially in today's global economy.

From the above table as well as the previous discussion, there is no preferred alternative. It is critical that any marketplace wishing to be competitive should obtain critical mass soonest. Elliff (2001) mentions that the original concept of these exchanges was for independent operators to facilitate interactions between buyers and sellers in fragmented markets. But most recently in many industries the major buying companies in that industry have set up and are operating their own exchanges.

An alternative is following the Convisint (www.covisint.com/index.shtml) example. This marketplace was borne out of the combination of existing e-business initiative from large OEM's in the automotive industry (such as Daimler Chrysler, Ford, etc.) and aggregated their total procurement. Far greater savings are possible through the exchange than through any of the individual efforts while sufficient industry support is present to drive the solution.

6.5.6. Suitability of purchasing through marketplaces

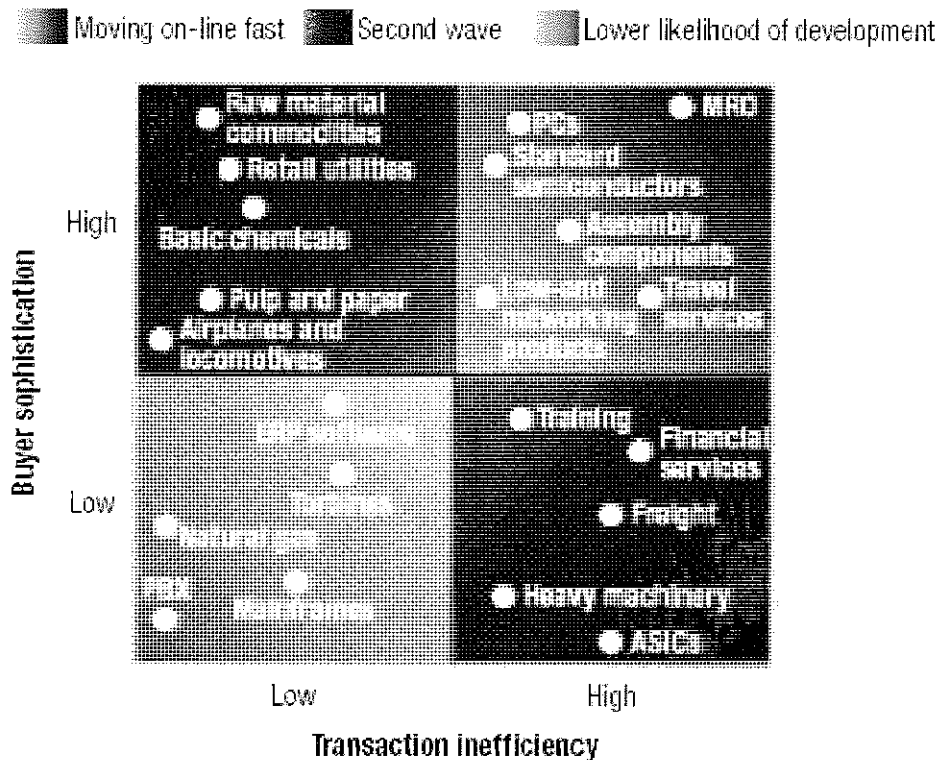
Companies purchase numerous different types of products continuously, with only a limited segment suited for trading through marketplaces/ over the Internet. The possibility of products being purchased through a marketplace or the Internet is further dependent on the Industry readiness. Berryman *et al.* (1998:132) mentions that the speed with which an electronic market develops for any products is dependent on:

- *The inefficiencies of current transactions.* This can include poor information flow, complex or multitiered distribution channels and fragmented supplier and customer bases.
- *The sophistication of buyers.* Customers' sophistication is measured by their ability to define clear product specifications, their understanding of the differences between vendors and how comfortable they are about buying a product without seeing it.

Berryman *et al.* (1998:133) groups the different product types according to the above two criteria as depicted in Figure 40.

FIGURE 40: OPPORTUNITIES FOR ELECTRONIC MARKETPLACES BY INDUSTRY

Opportunities for electronic marketplaces by industry





Kafka *et al.* (2000:a) emphasise similar aspects by mentioning that e-marketplaces will be most beneficial in industries with the following characteristics: 1) With a high degree of fragmentation, 2) highly cyclical or unpredictable supply or demand or 3) multiple distribution steps.

Inefficient and lengthy processes frequently hamper especially low value products. The average cost of stationery orders at First Rand Bank was in the vicinity of R210 per order, sometimes larger than the total order value. It is therefore no surprise that most e-procurement solutions initially started of with indirect products (especially MRO) as savings could easily be obtained.

The sophistication of buyers largely depends on the sophistication of the purchasing departments with in the organisations. Companies that pioneered the use of technology such as EDI would probably adopt e-procurement much earlier than others. Industries where these factors are not common, will probably take longer to adopt on-line trading and especially e-procurement.

The most important aspects are however the suitability of product presentation on an Intranet/Internet as well as the confidence with which buyers will buy based on visual product presentations. According to Kafka *et al.* (2000:a), the following type of products are best suited for e-procurement and especially for e-marketplaces:

- Highly standardised, like electronic components that are easily compared across suppliers, frequently traded.
- Low cost wares like fresh produce that benefit greatly by saving from transaction efficiencies.
- Perishable items like cargo capacity that has different values at different times.

The more standardised products are, the better their ability to be bought as “catalogue items”. The less standardised products are, the more likely they are not shown and bought as catalogue items. This does, however, not exclude negotiating longer-term contracts through auctions with these product types. Especially high cost items bought irregularly will still be based on high amounts of human interaction and will not be bought through an electronic means. The significance of on-line trade is, however, not only limited to the product at hand.



6.5.7. Future of on-line trading

The introduction of e-procurement and especially that of marketplaces have changed the way buyers and sellers interact with each other. Kafka *et al.* (2000:b) mention that the traditional processes of finding suppliers and negotiating long term contracts are changing. A trend is evident towards shorter contractual periods, of which the introduction of ASP solutions is an example. Therefore much more negotiation will happen, for which e-marketplaces are well suited.

Kafka *et al.* (2000:b) mention that e-marketplaces will extend their value add to include aspects such as the following:

- *Multi-attribute optimisation.* This will take non-price factors into account such as product quality, delivery time, service and geographic location. This will be necessary as in some areas quality outweighs cost in importance.
- *Multiparty.* This will facilitate connections with other e-marketplaces so that bidding prices will include options like shipping and financing. Companies will then choose a total solution, rather than independent fractions of the fulfilment.

From a general e-procurement perspective, it is likely that direct materials will be targeted after companies have conquered their indirect material spend. The significant difference between the two is however that indirect material is consumption driven and internally used, whilst direct material is based on forecasts and firm orders. Therefore direct material orders should be system driven unlike the current manually driven order generation. Orlov *et al.* (2000) add that e-procurement solutions require explicit approval, which wastes time and money. The superior alternative would rather be to only review purchases that exceed the spending limit or are outside the buyer's jurisdiction.

6.6. Chapter Conclusion

Many aspects relating to an online information interchange need to be formalised in deciding which is applicable to the company's type of procurement. To recap the following aspects were discussed:



- *Information exchange and data format.* EDI was the primary data format and the interchange of choice before the Internet. Due to especially its high set-up cost it was without the reach of many smaller suppliers/buyers. E-Procurement, making use of the Internet as backbone offers a much less expensive alternative, but currently no uniform technology as found in EDI, has been agreed upon. The most likely candidate currently seems to be XML, but standardisation will be vital to ensure integration into different systems.
- *Information platform and security.* Companies wishing to implement e-procurement have the option to use either an Intranet, Extranet or the Internet as platform. The platform chosen will indicate the necessary security, which should secure both the data and systems involved.
- *System integration and security.* Should a company wish to implement an e-procurement solution, it will work in conjunction with a number of existing systems in the company. These systems can be divided into internal (usually backend systems such as ERP) and external systems (of which ASP's are good examples). These systems will add functionality to the e-procurement system by "closing the loop" as well as assisting in direct procurement. Once again a uniform data format is essential to ensure successful integration.
- *Business Models.* Companies chose between either a sell-side, buy-side or marketplace solution. Each of these three options has advantages and disadvantages and the choice is influenced by a number of aspects such as the product type, the procurement role players, the trading platform and data formats.

Figure 41 shows the relationship between the above aspects.

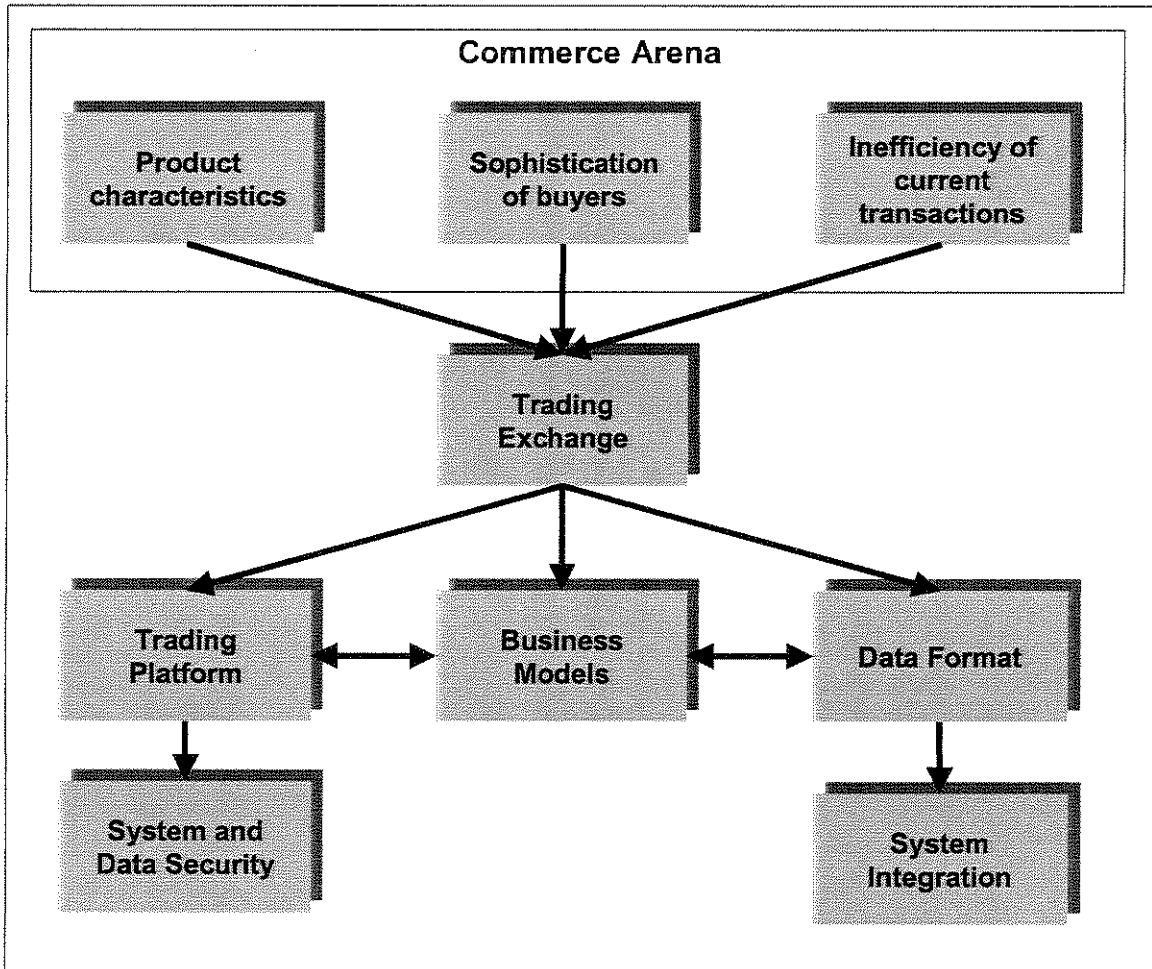


FIGURE 41: TRADING AND INFORMATION EXCHANGE FRAMEWORK

It is important to note the direction of the various arrows in Figure 41, starting with the commerce arena (the product characteristics, the sophistication of the buyers and the inefficiencies of current transactions) working through to security and integration possibilities. Also important to note is that the business model chosen will influence and be influenced by the same factors, namely the trading platform as well as the data format.



CHAPTER 7

E-PROCUREMENT IMPLEMENTATION AT SASOL



7. E-PROCUREMENT IMPLEMENTATION AT SASOL

7.1. Chapter Introduction

Sasol is the South African e-procurement pioneer, being the first company to implement such a solution within South Africa. In collaboration with CommerceOne (a world-wide leader in e-procurement solutions) it also erected the first horizontal procurement exchange in Africa, namely MarketSite Africa™. This chapter aims to discuss why Sasol decided to implement an e-procurement solution, advantages experienced through implementing an e-procurement solution, the current functioning of their solution and the products purchased through the solution. The chapter concludes with the decision support framework (called the “Funnel Model”) used for choosing the correct products to be procured using e-procurement, as well as to prioritise roll-out of the solution throughout the company.

7.2. Company Background

Sasol is South Africa’s largest producer of synthetic fuels and chemical products with a turnover exceeding R41-billion per year (2001 figure). The company was founded in 1950, after legislation in parliament was passed for the establishment of an oil-from-coal industry. In the past 52 years, the company has erected two large plants in both Sasolburg and Secunda and has extended operations overseas.

Sasol Limited holds 24 associate companies (16 direct and 57 indirect subsidiaries) scattered across Europe, Asia, Australia, Africa and the Americas. The Sasol group of companies is made up of diversified fuel, chemical and related manufacturing and marketing operations, complemented by interests in technology development, oil and gas exploration and production. This enables Sasol to produce in excess of 150 fuel and chemical products, which are exported to more than 70 countries around the world. Today Sasol is one of South Africa’s Top 10 companies with a market capitalisation amounting to R25-billion. The company also has more than 15,000 shareholders and employs over 26,000 people.



7.3. Procurement Background

Sasol realised the enormous potential of electronic commerce in the petrochemical market, wishing to become a respected global enterprise. Its e-procurement implementation was the first step in a larger e-Business project that forms part of its Total Cost of Ownership programme. Currently a number of other similar projects are underway, which includes CRM and Sasol.com projects. After eight months of researching the e-commerce market, Sasol decided in March 2000 to implement the Commerce One BuySite™ e-procurement application to automate some of its purchasing. Implementation started in May 2000 with 350 users and only four suppliers, but has since rolled out the solution to 2,800 users across the company. The project took longer than initially expected due to the complexity of ERP integration with the Commerce One BuySite™ e-procurement application.

South Africa only has three strong independent horizontal portals, namely MarketSite Africa, B2B Africa (part of the Transnet group) and Quadrem (which is linked to the mining industry) illustrating why CommerceOne was the solution of choice. Sasol wished to join an independent solution, and therefore chose CommerceOne.

The e-procurement process enables SASOL to submit orders (processing approximately 5,500 transactions per annum to the value of R5 million rand per week or 25% of the total number of transactions processed) to the Commerce One South Africa's MarketSite™ portal and delivered orders instantaneously to several suppliers. Currently about 80 of Sasol's total of more than 1,500 customers are trading on-line through the system. The MarketSite™ portal enables Sasol not only to trade with its local suppliers, but through the Commerce One Global Trading Web™ also has access the world's largest electronic marketplace for goods and services.

The CommerceOne value proposition provided Sasol with a galaxy of opportunities and advantages, of which the most prominent are listed in Table 30.



TABLE 30: COMMERCE ONE VALUE PROPOSITION

Advantages to Sasol	Advantages to Sasol's suppliers
Significant purchasing process savings and reduced maverick spend	Provides increased access to buyers
Simplification of the purchasing process	Streamlines order processing
Ability to reconcile transactions automatically (reconciling what was delivered to what was ordered to what was paid for)	Markets vendors' products and services to new customers through the Commerce One Global Trading Web
Removing some duplication of work across the business units	Lower cost of sales per customer
Obtaining group-wide volume agreements with suppliers.	Shorter payment cycles

Sasol has from the start seen the project not only as a cost saving exercise, but a number other factors were also considered. Their focus was never to reduce staff, but rather to release the capacity tied up in processing routine transactions. This resulted in purchasing staff having more time for strategic activities (such as pricing negotiations and supplier relationships) rather than order processing.

Sasol did not benchmark process costs when the project started, but has since built a benefits model. This model is currently used to establish probable savings before rolling-out BuySite™ at new business units. This benefits model is largely based on process savings, but takes savings into account from on-contract buying vs. that of maverick spend.

Sasol realised significant purchasing savings since implementing e-procurement, of which the following is the most significant:

- A cost reduction of approximately R100 per order (from R120-R140 per order down to R27 per order). The bulk of these savings are attributable to people's time becoming freed-up from the process (40-50% of the total saving). This relates to an estimated saving of R400,000 per annum.
- A time reduction in order fulfilment time (from requisition to delivery) from 29 days previously to eight days currently (a saving of 72%).

Sasol uses a decentralised purchasing structure, whereby the bulk of purchases initiate and are executed at Strategic Business Unit (SBU) level. Each SBU has sufficient expertise of all the products purchased at the specific SBU and handles approximately 60% of the purchasing **volume**. The various product specialists scattered throughout the various SBU's are combined into a commodity team to exercise sufficient control over the purchasing of higher value items. This centralised commodity team therefore controls the bulk of the value purchased (totalling approximately 70% of the **value** purchased). These commodity teams have a strategic sourcing or contract negotiation responsibility of all purchasing contracts in Sasol, while the actual requisitioning or buying remains with the SBU buying officers.

The managing director of each of the business units not only heads up the unit's purchasing department, but also regularly meets in a partner meeting to discuss group-wide purchasing issues. The decentralised purchasing structure with the partner meetings and commodity teams are shown in Figure 42.

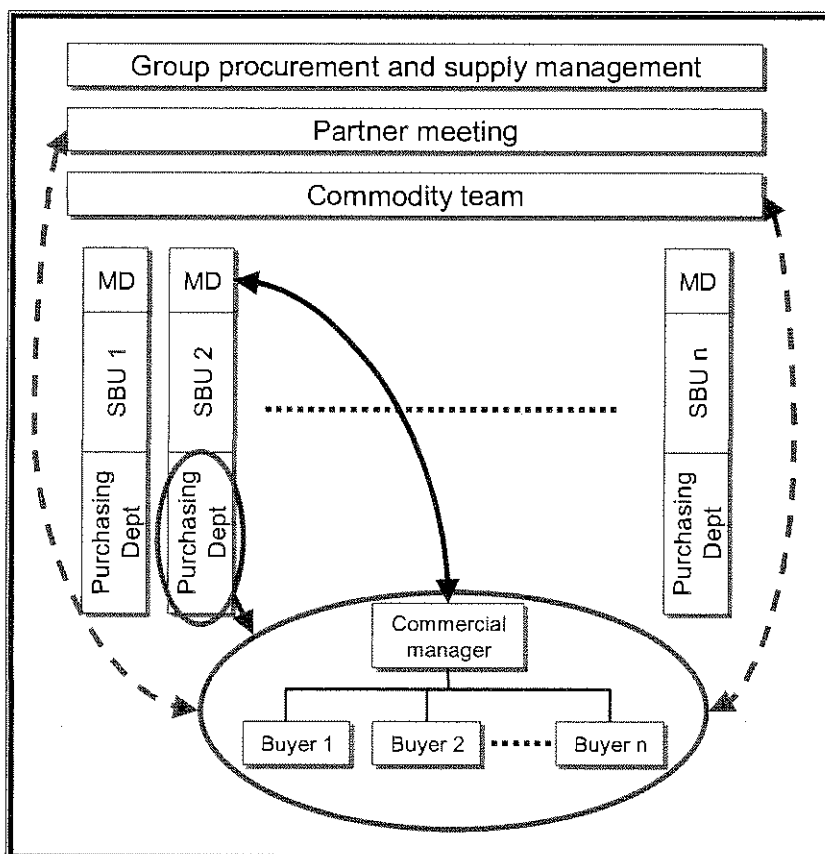


FIGURE 42: SASOL'S PURCHASING STRUCTURE



7.4. Procurement Processes

Prior to introducing e-procurement, the bulk of Sasol's commodity spend was conducted through a manual process involving the ERP system, while some of its more specialised indirect and some direct goods was purchased using EDI. The bulk of the transactions executed via EDI was sent as fax rather than electronically to vendors.

Also due to its decentralised procurement process for unspecialised indirect goods (such as stationery), it was not able to enforce contracts and control spending with the organisation. With the very fragmented supplier base in South Africa, this resulted in many of the SBU's using phones and faxes (not catalogues) to process transactions resulting in little or no post purchase information. These transactions were characterised by a substantial amount of off-contract purchasing (maverick buying). When Sasol started with the e-procurement project, its focus was therefore not limited to automating purchases, but also included improving control over purchases made by casual buyers.

Sasol therefore had to redesign its whole ordering process for the commodities targeted by e-procurement. While the process previously conducted had many variations and was lacking control, the new process is standardised with buyers only being able to purchase from listed suppliers (off their on-line catalogue). This process is also advantageous to users making comparison-shopping (comparing between listed suppliers) much easier than before. The new improved purchasing process is shown in Figure 43.

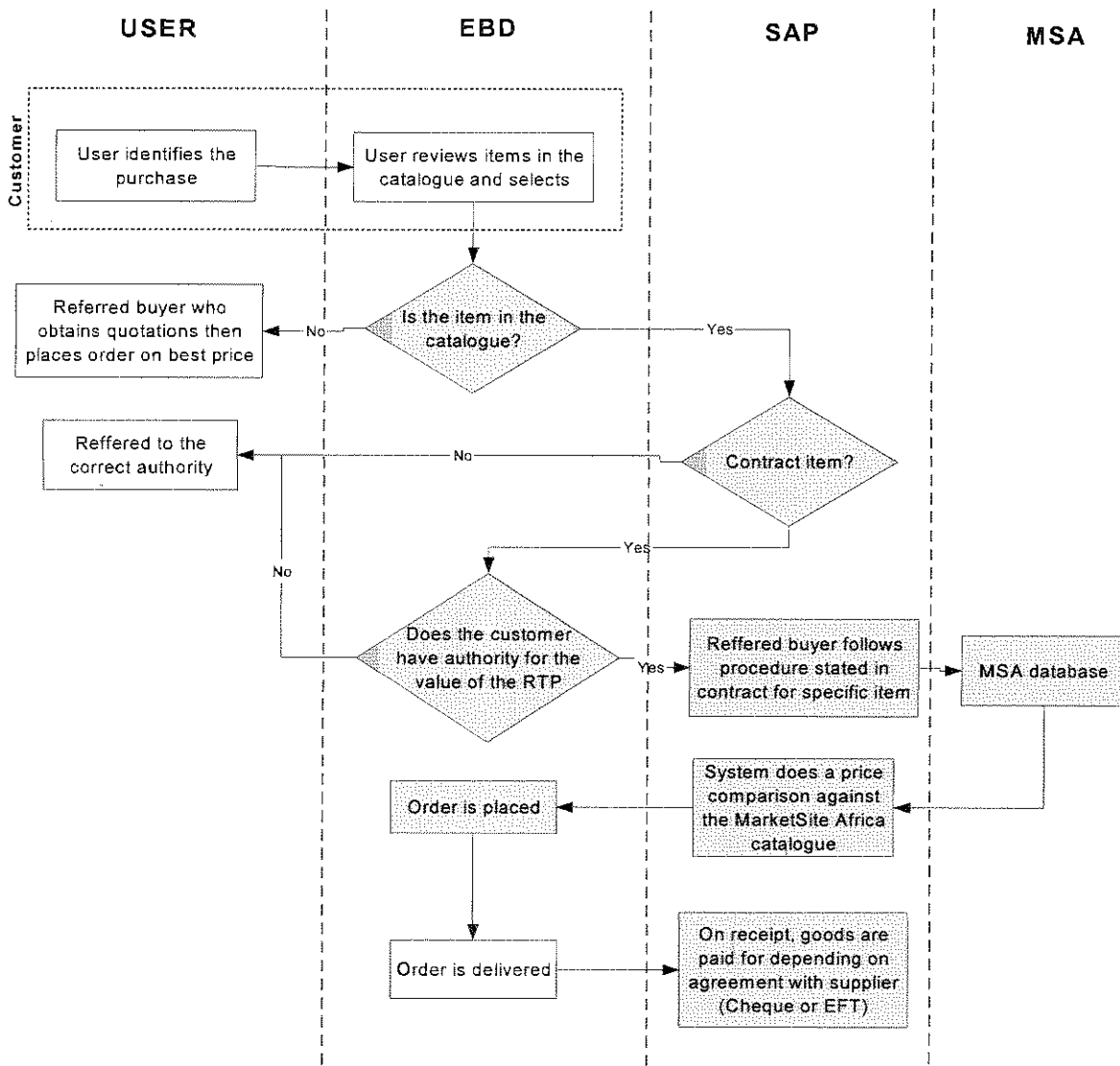


FIGURE 43: SASOL'S E-PROCUREMENT PROCEDURE

Uncoloured blocks in the above figure indicate human intervention, while coloured blocks show system processes. As little as one person is therefore required to execute a desired purchase, take delivery of the purchase and pay the supplier. e-Procurement has enabled self-invoicing, which eliminates several reconciliation steps and reduces the number of month-end discrepancies as all business units now work from the same catalogue. Additional intervention is done by exception only, such as the purchase exceeds the user's buy limit or when a product is not contracted.

BuySite™ is workflow enabled whereby purchases requiring authorisation (being either above the users purchase limit, being a commodity he/she may not purchase, etc.) are routed to a superior. Some of Sasol's SBU's have chosen to forward certain specialised items to a buyer who then validates the purchase. Corporate control is also possible by means of the database within which all history of every purchase made is stored.

The purchasing process completed in BuySite™ is mirrored in the ERP system, with the following interfaces existing between EBD and the ERP systems:

- The ERP system verifies the cost code of the user and the product on BuySite™.
- When the product is selected from the catalogue on BuySite™, the ERP system generates a purchase order number.
- The ERP system marries the captured delivery note to the purchase order in the system. If a three-way tie exists the ERP system automatically initiates the payment cycle (automatic payment system).

This process as well as the interaction with The MarketSite™ portal is shown in Figure 44.

ERP / EBD / MarketSite integration

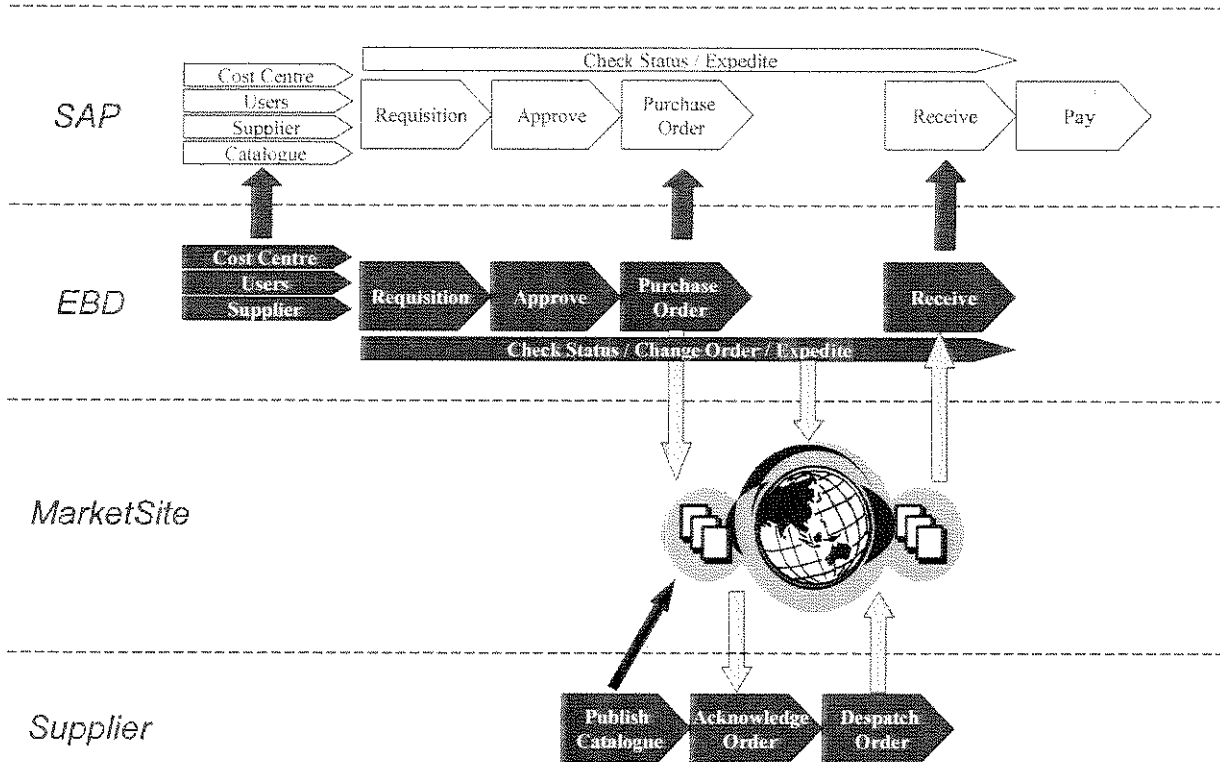


FIGURE 44: ERP/ EBD/ MARKETSITE INTEGRATION

Although Sasol is aware of the significant savings potential through electronic sourcing (Auctioning, electronic RFIs, electronic RFQs, etc.), it has only automated the purchasing process. Supplier selection at Sasol is not based purely on purchasing price and is complicated by aspects such as delivery lead-time, SMME rating, service record, etc. The sourcing application should also be integrated with the ERP solution, which further complicates electronic sourcing.

Sasol is currently testing Intenda's (www.intenda.co.za) ProQure solution, but for the time being the strategic sourcing process at Sasol is similar to that prior to e-procurement.

7.5. Products Procurement

Sasol's e-procurement focus is built around products suited for catalogue buying, for which contracts exist, are used throughout the group and are ordered by a huge number of end users. This includes items such as stationery, hand tools, office furniture, cleaning materials, lubricants, nuts and bolts and safety signs. As catalogues only capture up to three lines of detail, only "standard commodities" are targeted. Other more complex items (such as bearing which are also MRO items) cannot be accurately described using catalogues and does not form part of their e-procurement focus. The remainder of its procurement spend is channelled through its ERP system from where they are looking to optimise total cost of ownership for procurement of these items. Figure 45 visually depicts this strategy.

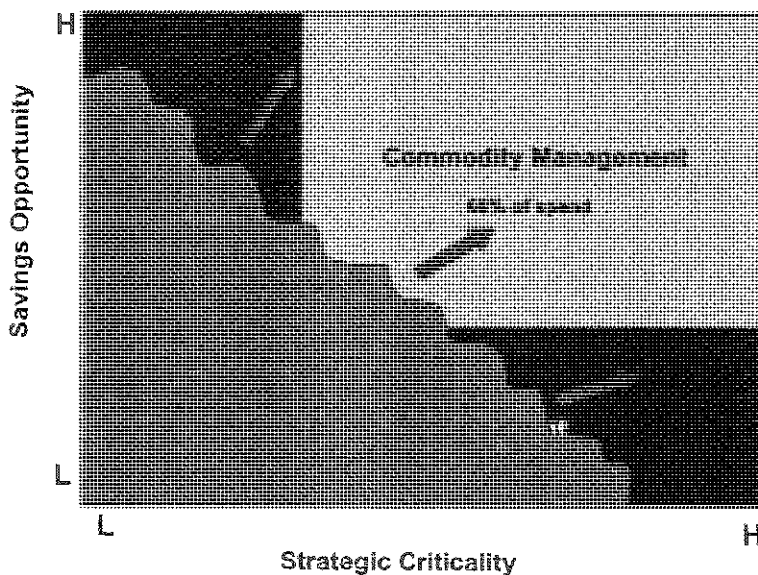


FIGURE 45: SASOL'S E-PROCUREMENT IMPLEMENTATION STRATEGY



Electronic transacting allows decentralised end users to requisition low value high volume goods from an electronic catalogue, without further involvement from the centralised buyers. As mentioned previously centralised buyers will still be required to set up electronic contracts and catalogues.

The next phase of the e-procurement implementation would be to expand the range of goods purchased through MarketSite™ portal to include "critical MRO", including spares for plant and refinery equipment. Critical procurement is more complex than non-critical procurement since the standard Commerce One catalogue does not cater for the intricate technical detail needed when buying critical goods. Due to the criticality of the items, Sasol holds sufficient inventory of the products in stock.

Sasol does not aim to eventually procure all its products through the e-procurement solution, primarily due to the constraint of having to use catalogues and not all products are suited for catalogues. Capital expenditure (cappex) is handled by Sasol Technology on a contract process, and will probably never be purchased electronically. Due to the extent of the contract negotiation process, electronic sourcing however has a high cost saving ability for cappex purchases.

Sasol does not foresee buying services on-line due to a number of complexities associated with buying services, of which the following are prominent:

- Unlike goods purchased, the service provided is frequently different to that initially purchased.
- Services are too complex to choose between, especially that of hourly labour.

CommerceOne has a service procurement solution specifically aimed at purchasing services on-line, but is too expensive (approximately \$3 million) for feasible implementation at Sasol.

7.6. Role Players in the Procurement Process

As e-procurement currently only addresses a small part of the indirect material purchases, it is currently unforeseeable that it will have any effect on the constellation of the indirect goods value chain. Buying closer to the source of supply (at OEM level) usually does not fit those suppliers' business models as they do not intend dealing with an unlimited number of end users. MRO items regularly include a huge number of spare parts, which these manufacturers also do not intend cataloguing and selling; they would rather have an intermediary supply of these articles.



Although Sasol is very aware of the possible savings in reducing the supply base, it was never aimed for in the e-procurement project. Sasol supports both BEE (Black Economic Empowered) and SMME's (Small, Medium and Micro Enterprises) initiatives focussed on growing small businesses. Through rationalisation Sasol could very well exclude these suppliers and not support similar development.

Sasol uses a vertical supply focus, in which they group similar commodities based on strategic characteristics and strategic value to the company. Each "commodity group" is then focussed on independently in determining which is the optimal way in purchasing the commodity. This includes the technology to be used, the supply base management or reduction as well as the purchasing process. This approach has advantages, but could complicate integration issues (especially to ERP solutions) if a number of different technologies are implemented at Sasol.

Sasol conformed to only using e-procurement for purchasing the commodities mentioned previously. Although not directly, existing suppliers supplying these items were forced to use the MarketSite™ portal. Users are obliged to use the system in purchasing these commodities and are unable to bypass the system by conducting off-contract purchases at local suppliers.

7.7. Procurement Logistics and Supply Chain Management

Although the Internet provides the facility for Sasol to disintermediate their supply chain, as yet it has not had the effect at Sasol. Currently the bulk of direct materials are sourced within the Sasol group: mining supplies coal to extraction, which on their turn supplies some other downstream Sasol company. For similar reasons electronic trading has not enabled Sasol to outsource a large part of the value chain and the bulk of value adding still resides within the Sasol group. Electronic purchasing is therefore less prone to redefine the direct goods supply chain at Sasol.

Sasol has not started any electronic pull systems through which orders are electronically placed based on demand or potential demand. The demand for the "standardised indirect goods" currently focussed on with e-procurement is too fragmented throughout the group, making electronic order initiation unlikely. An electronic pull system is, however, not totally excluded from the broader e-procurement strategy at Sasol and could very well form part of purchasing direct goods on-line. More specialised indirect- and direct goods that are not suited for catalogue buying usually have a better-known demand (or a demand which is easier determined/forecasted) and better match electronic pull applications.



e-Procurement at Sasol pivots around individual rather than collective wants or needs. Therefore no across company planning and ordering exists. Requisitions initiate at individual departments and are not aggregated to company or SBU level. At Sasol head office for instance, products are delivered to the desk of the user that initiated the order.

Sasol forces a policy of vendor held stock, in which stock levels are minimised as far possible with excess stock residing at vendors. Stock of the items purchased through the e-procurement system is scattered across different departments and predominantly reside at individuals' desks. The significant decrease in order fulfilment time has reduced safety stock of items, resulting in working capital savings amounting to R1 million!

For items that are prone to electronic order initiation (predominantly direct goods and some complex indirect goods), it will be very valuable to control inventory centrally. Due to the high value of individual items as well as the accuracy of stock on hand, it is suggested to have sufficient knowledge of inventory at a central level.

7.8. Trading and Information Exchange

At the time the e-procurement project started, Sasol had implemented no fewer than 22 different enterprise resource planning (ERP) systems across its global businesses. Eighteen of the SBU's each had different versions of SAP, which complicated the integration with Commerce One even further. Although Sasol started off by using Walker, Mims and SAP ERP systems, it has recently standardised on SAP4.6c throughout the business.

The first implementation phase therefore focussed on a simple integration to the three most common ERP systems in Sasol, namely SAP, Walker and MIMS. Sasol initially had to develop a tailor-made application that interrogates the Enterprise Buyer SQL database and translates data from XML format into the naïve format of the ERP system to which messages are being sent. More recently Sasol moved to a unified integration platform, implementing Neon (middleware software and a partner of Commerce One). This configuration is shown in Figure 46.

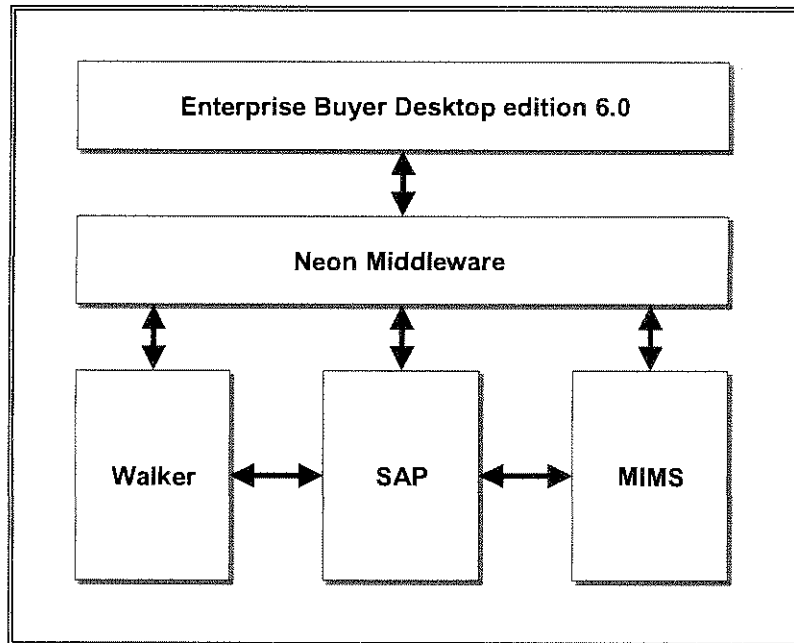


FIGURE 46: SASOL SYSTEM BUILDING BLOCKS

Due to the synergetic relationship existing between Commerce One (marketer of EBD v. 6.0) and SAP, it will be possible to integrate EBD and SAP in future without using any middleware.

As mentioned previously the more specialised products in Sasol are not suited for catalogue buying but it would be possible to order these items directly out of the ERP system. Currently the limited number of items ordered directly out of ERP systems require EDI intervention: either to communicate to other companies directly or alternatively through fax generation (the bulk of communication built around fax generation).

The installation of e-procurement and especially the erection of the MarketSite™ portal could also revolutionise the ordering process of non-catalogue items. The ERP systems can be integrated directly with the MarketSite™ portal eliminating any EDI intervention. Rather than to upgrade all the different direct links with suppliers, only the link with the MarketSite™ portal would have to be upgraded. It is however unlikely that this will erode EDI traffic; rather new relationships will be built without using EDI mediation.

Currently EBD is predominately installed at the Secunda and Sasolburg facilities. EBD is also rolled-out at Sasol Head Office in Johannesburg, but has not had the same acceptance compared to that in Secunda and Sasolburg. This is mainly due to the larger initial implementing focus at Secunda and Sasolburg compared to head office. It is expected that acceptance at Head Office will slowly grow as personnel becomes accustomed to purchasing on-line.

Overseas companies within the Sasol group have not been targeted by the e-procurement implementation as their largest procurement spend is on supply streams from other companies within the group. It is however expected that the solution will be introduced to both US and European companies by end 2003. One of the largest barriers Sasol currently expects in implementing the solution (especially in the European market) is the language barrier (introducing the catalogue to non-English speaking countries). The total IT set-up in Sasol is shown in Figure 47.

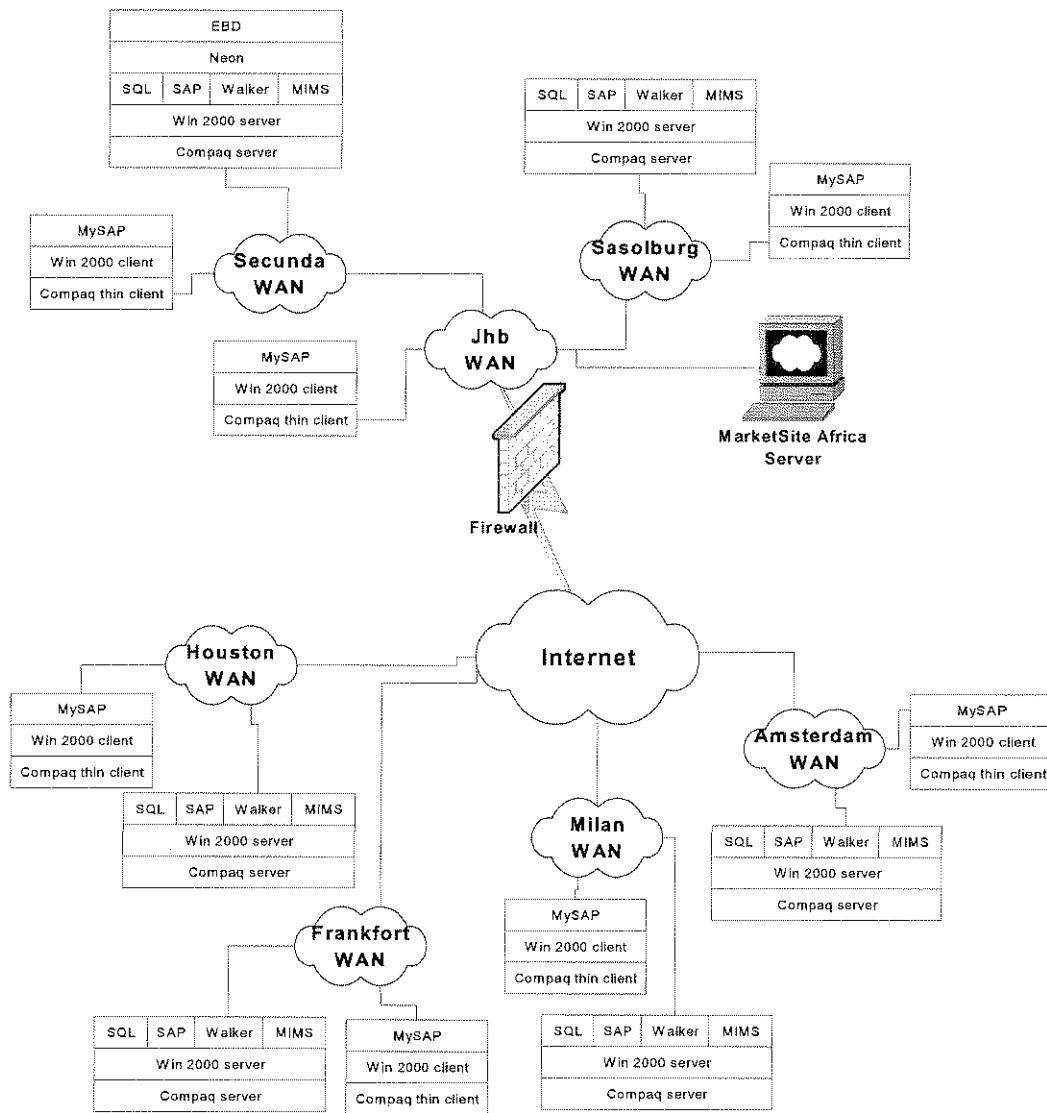


FIGURE 47: SASOL E-COMMERCE HARDWARE CONFIGURATION



From the above figure it is clear that EBD occurs at users' desktop behind a firewall. For increased security, messages sent between EBD and MarketSite™ is encrypted. Currently the only insecure link in the ordering process is that between MarketSite™ and the vendor. Currently the Bidvest group is the only Sasol supplier integrated with MarketSite™. They have erected their own portal, which downloads orders placed to the company directly from MarketSite™. All the other suppliers use dial-up connectivity on a stand-alone PC with Internet access to download orders onto.

Security issues amongst others have forced Sasol and CommerceOne (owners of MarketSite™ Africa) not to allow suppliers to access their catalogues directly. A much more manual content management process is used, whereby suppliers forward catalogue changes (such as price increases) through to Sasol on a spreadsheet. Sasol verifies the changes to the contract and if the changes are accepted they forward the update to CommerceOne who then makes the amendment. When the amendment is made on MarketSite™, it automatically updates the catalogue residing on BuySite™ solution.

Another complication of content management is that CommerceOne does not have a unique catalogue standard used throughout all their MarketSite™'s. Should a supplier therefore wish to communicate with another vendor on another MarketSite™ (such as the European one), it would have to produce another catalogue based on that MarketSite™'s catalogue standard. On the long run this would complicate and duplicate content management for the supplier. Currently Sasol is involved in developing a new cataloguing standard USC (Universal Standard Catalogue) that will not only more uniquely standardise the description of line items, but will also allow better describing items that is currently found in UN/SPSC standard.

7.9. Funnel Model

Sasol had to consider a number of different aspects when they started with the e-procurement project, which included:

- The products to be addressed.
- The IT integration needs.
- The readiness of the different business units.
- The supplier adoption strategy.
- The sourcing strategy.

To ensure all of these factors are incorporated in deciding the correct approach, Sasol developed a “Funnel Model”. They developed this model for application in their multi-unit enterprise to determine which commodities at which business units impacting which information technology integration needs should be addressed. Figure 48 shows this model.

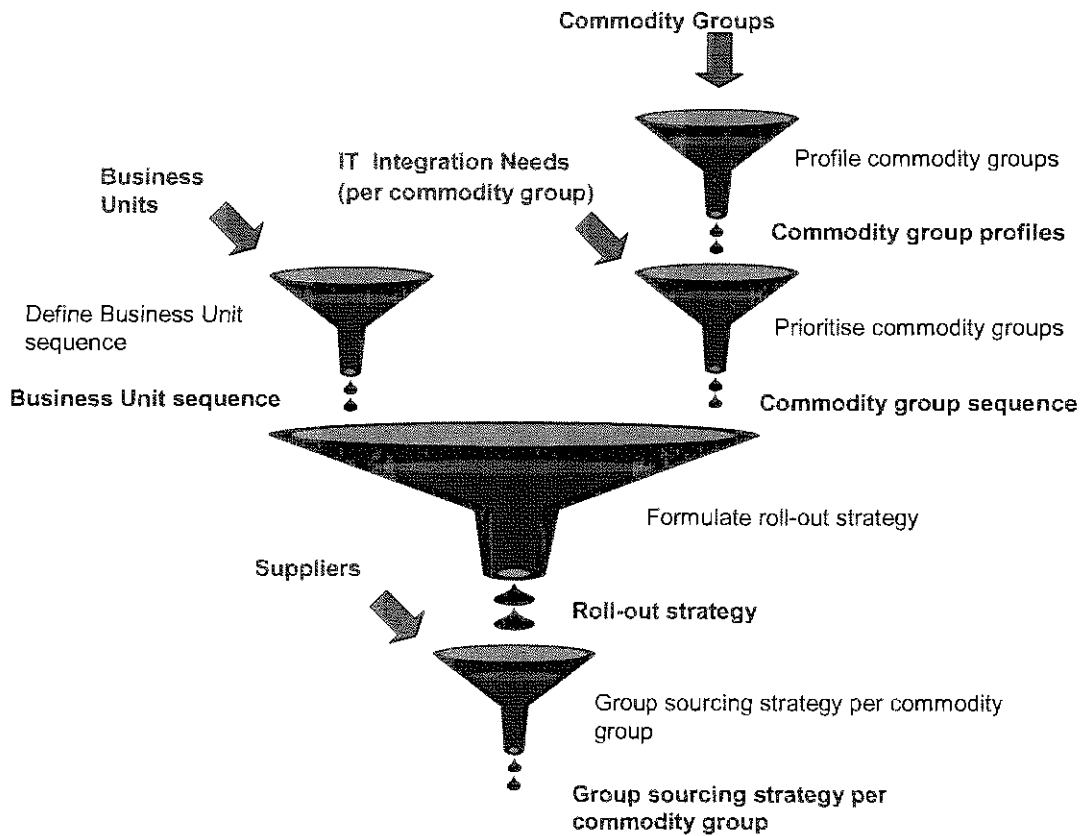


FIGURE 48: SASOL E-PROCUREMENT DECISION MODEL

Each of the above “funnels” will be discussed in the following paragraphs.



7.9.1. Commodity groups

In deciding which products to adopt the e-procurement solution for, Sasol created commodity groups (or “clusters”), grouping similar commodities together. Sasol created 50 distinct groups based on any of the following criteria:

- Similar physical characteristics (e.g. bearings)
- Similar end users (e.g. stationery)
- Similar suppliers (e.g. electronic components)

Each of these groups were rated on their suitability for e-procurement, based on the following:

- *Transaction volume or the number of transactions.* The quantitative value was used.
- *Potential to reduce stock.* Each commodity group was rated with a qualitative rating from 0 (no benefit) to 10 (major benefit).
- *Percentage direct spend.* The total percentage spend within the commodity group that was off-contract (maverick spend) was determined. Because reduction in maverick spend is one of the key drivers of e-procurement value, the more off-contract spend there is in a commodity group, the greater the potential value of implementing such a solution.
- *Potential to improve catalogue.* A qualitative rating was given to what purchasing benefit the provision of an electronic catalogue would have. Where the commodity group contains a large number of products, is complex or fast changing, or existing catalogue information is poor, the provision of this catalogue may be of significant benefit.

Sasol gave a weighting to each of the above criteria, of which the transaction volume was assigned 50% of the total weighting.

7.9.2. IT integration needs

Each commodity group is procured differently, using different processes as well as requiring different levels of integration between the e-procurement systems and the back-end (typically ERP) systems. This implies different integration requirements for each commodity group. Sasol identified the following five factors that impacted the integration needs:

- *Purchase process.* Users can either purchase from stock or directly from the supplier.
- *Inventory.* Stock can either be tracked using the ERP-application (usually products located in a centralised store) or would have no tracking (of which stationery scattered across different users' desks is a good example).
- *Charging.* Purchases can either be charged against a cost centre, a works order or a piece of equipment.
- *Source of Demand.* The source of the demand can either be planned (MRP generated) or unplanned (generated directly by a user).
- *Catalogue Complexity.* A commodity group could either be catalogued on a UN/SPSC catalogue or would be too complex, requiring an alternative configuration.

Using the above criteria, Sasol determined the required level of integration. The following table indicates the integration requirements:

TABLE 31: IT INTEGRATION NEEDS

Process Characteristic	Integration Need
Inventory	Integration with stores catalogue
Demand generated by ERP	Integration with MRP
Charged against work order	Integration with Works Order structure
Complex catalogue (too complex for UN/SPSC)	Integration with 3 rd party catalogue system

Each of these integration needs differ in complexity and therefore the time and effort required to complete the integration. Sasol at this point in time plotted each commodity group against two axis's: i) The savings opportunity and ii) Level of integration required. From this process, commodities with high savings opportunity and a low level of integration needed are preferred for e-procurement, while the opposite is worst suited. Using this plotting mechanism, Sasol was able to prioritise its commodities targeted by e-procurement.

7.9.3. Business Units

After Sasol decided which commodities to target for e-procurement, user adoption and –readiness followed. The qualitative model used by Sasol to rank business units consists of the following criteria:



- *Spend characteristics.* Aspects such as the volume of the Business Unit's procurement spend (in terms of value and transactions), and the mix of suppliers and commodities was surveyed.
- *Technology characteristics.* This consisted of ranking the quality of the Business Unit's existing IT systems, infrastructure and support.
- *Change readiness.* A number of different aspects were investigated, such as the business structure, the culture, the attitude of the key stakeholders, etc. to determine how well the Business Unit is prepared for change.

It is clear that only the first characteristic is based on tangible aspects, while the last two are purely qualitative. Using the above criteria, a number of well-defined KPI's was identified to ensure efficient rating of different business units.

7.9.4. Roll-out strategy

Using the commodity group profiles and the business unit sequence, Sasol formulated a roll-out strategy. They plotted commodity group sequence against the business unit sequence and formulated a high-level project plan. A more detailed project plan slightly changed this sequence, as other local considerations had to be considered.

7.9.5. Suppliers

The next consideration consisted of information about suppliers for each of the selected commodity groups. Once again Sasol used a number of criteria to rank the suppliers:

- *Price, quality, range, lead-time etc.* Sasol used these traditional characteristics by which supplier quality are to be measured. These factors are different for each commodity: in some commodities price is the key consideration, while in others this might be outweighed by considerations of quality, lead time or other factors.
- *Quality of business processes/systems.* A supplier with effective business processes/systems was able to better participate in e-procurement.
- *Catalogue quality.* As provision of a quality electronic catalogue is critical to e-procurement, suppliers already able to provide such a catalogue was adopted much easier.
- *Relationship to buying organisation.* Suppliers with a long-term relationship with Sasol were considered more favourably.

- *Social considerations.* Due to Sasol's responsibility in supporting social programs, it had to take social considerations (e.g. a need to support SMME's) into account.

The weighting of each of the above criteria differ between the commodity groups, each receiving a rating between 0 (least favourable) and 10 (most favourable). The total score per supplier is an indication of the suitability of the supplier for e-procurement adoption.

7.9.6. Formulate group sourcing strategy per commodity group

The purpose of the fifth and final funnel was to design a sourcing strategy per commodity group. Inputs to this funnel consist of commodity groups for consideration (from the roll-out strategy) and suppliers rankings for the commodity group. In formulating a sourcing strategy for a particular commodity group Sasol based their strategy on the sourcing strategy matrix designed by McKinsey shown in Figure 49.

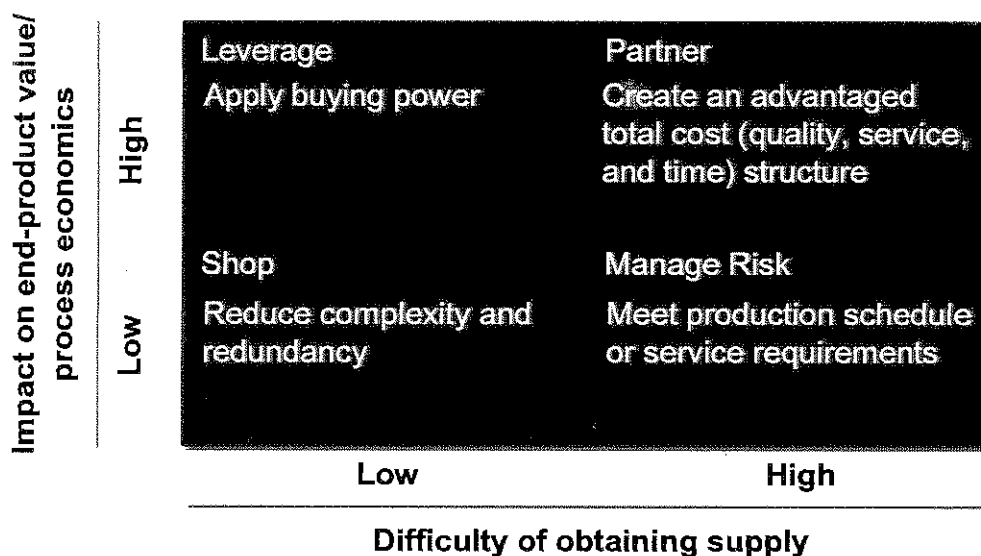


FIGURE 49: SOURCING STRATEGY MATRIX

Using the above strategy, Sasol was able to determine which of the suppliers to target for adoption.



7.10. Chapter Conclusion

Sasol implemented e-procurement for a number of reasons, but primarily to streamline existing procurement processes and to improve control over low value items with a large number of purchasing transactions. Sasol followed a systematic “Funnel” approach in deciding which products, which suppliers and which business units to target with e-procurement. The approach also enabled them to determine their roll-out strategy.

Although Sasol encountered more stumble blocks than initially expected, they have successfully implemented the CommerceOne BuySite™ solution to three sites within the Sasol group. Without the existence of some structure in strategising product, IT and supplier adoption, the process would definitively not have realised the significant savings experienced to date. Sasol will also use the model to prioritise further roll-outs of the CommerceOne e-procurement solution within the group.



CHAPTER 8

A FRAMEWORK FOR E-PROCUREMENT



8. A FRAMEWORK FOR E-PROCUREMENT

8.1. Proposed Framework

The aspects discussed throughout the document supports establishment of a framework in one of two important ways: i) To assist in deciding if the purchasing aspect is relevant to e-procurement and ii) Choosing the correct e-procurement delivery solution. It is therefore important that the chosen framework firstly has to rank and determine which products are suited for e-procurement and based on the findings to develop a suitable solution.

Sasol used the Funnel Model to determine a roll-out strategy for CommerceOne BuySite. Sasol already chose the CommerceOne's Buy Site solution and rated all products for the chosen solution. Furthermore the model served as a roll-out prioritisation tool, ranking internal business units as well as their suppliers to determine a roll-out sequence.

The Funnel Model, however, does not assist in determining the most suited e-procurement solution for the company. Furthermore the Funnel Model investigates only a few aspects to determine the feasibility of using e-procurement, ignoring aspects such as role-player and procurement feasibility. As the Funnel Model is primarily an implementation tool, the need still exists for an e-procurement evaluation tool.

Looking at the aspects discussed in the document thus far, the chapters on procurement and its process as well as both the chapters on products and role players are used to rate and rank the delivery for e-procurement. The two chapters following (focussing on supply chain management and trading exchange) form the basis to compare different information architecture and solutions to each other and to determine the most susceptible for e-procurement. All these factors are combined into a proposed framework shown in Figure 50.

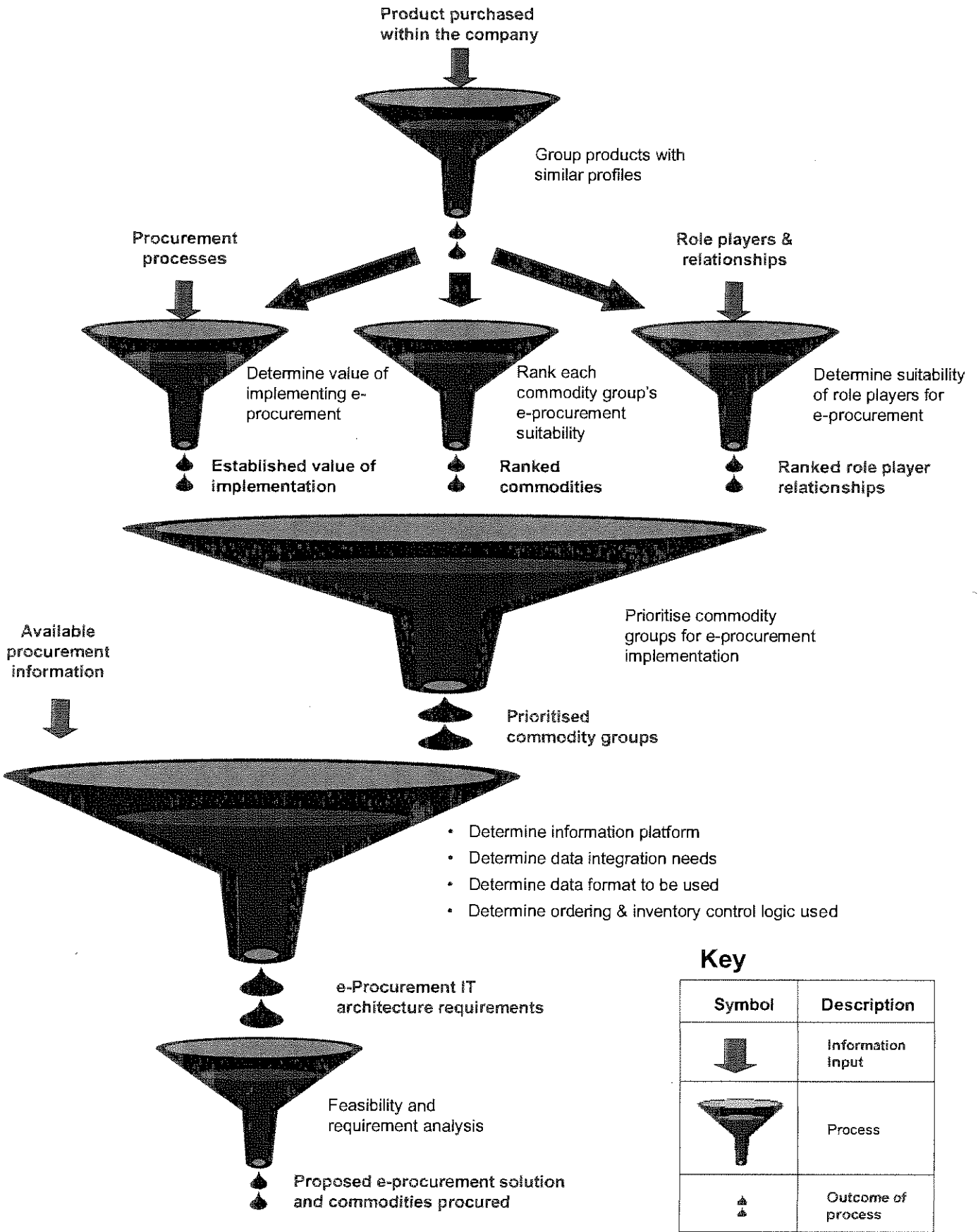


FIGURE 50: A FRAMEWORK FOR E-PROCUREMENT



The framework follows a top-down logic, with decisions made in higher “funnels” as an input to lower decision points (or “funnels”). The functioning of the each of these decision points or “funnels” are discussed individually in the following paragraphs.

8.1.1. Grouping similar products

As companies usually buy a vast array of SKU's, it is suggested to group products with similar characteristics into commodity groups. Different strategies can be used to group the commodities, of which the following are probably the most common:

- Products with similar physical characteristics (e.g. bearings)
- Products with similar end users (e.g. stationery)
- Products with similar suppliers (e.g. electronic components)

For illustration purposes, four commodity groups are used throughout the discussion: i) Office Stationery, ii) Lubrication oils, iii) Cables and wires and iv) Nuts and bolts.

8.1.2. Commodities feasible for e-procurement

The most important characteristic that determines if a commodity group is suited for e-procurement is the nature of the product itself. It is therefore important to rate each of the commodity groups' susceptibility towards e-procurement. It is suggested to rate each commodity group according to the criteria set in Figure 8 on page 57:

- *Product value* (products with lower value are rated higher than higher value counterparts). Using the average item value for the products in the commodity group is recommended.
- *Product characteristics* (homogeneous products are rated higher than heterogeneous ones). A qualitative value, ranging from 0 (all products in the commodity group are heterogeneous) to 5 (all products in the commodity group are homogeneous) is suggested.
- *Product type* (indirect goods are rated higher than direct goods). Once again a qualitative value, ranging from 0 (all products in the commodity group are direct) to 5 (all products in the commodity group are indirect) is suggested.

- *Number of suppliers* (a large supplier base is rated better than a small base). Once again a qualitative value, ranging from 0 (all products in the commodity group are purchased from a small supply base) to 5 (all products in the commodity group are purchased from a large supply base) is suggested.

An example of rating commodity groups in terms of the above criteria is shown in Table 32.

TABLE 32: RATING COMMODITY GROUPS FOR USING E-PROCUREMENT

Susceptibility of Commodity Groups for e-Procurement					
Commodity Group	Avg Item Value (R)	Product Characteristics	Product Type	Number of Suppliers	Susceptibility for e-procurement (rating out of 5)
General Supplies	50	3	5	1	3.11
Lubrication oils	150	5	5	2	3.44
Construction	10000	3	1	2	2.22
Nuts and bolts	3	5	1	1	1.75

From the above table it is clear that all aspects contribute towards a commodity group's susceptibility for using e-procurement. As the item value (column 2 in the above table) is a quantitative rating and all others are qualitative, it is recommended to convert the item value to the same rating out of 5, otherwise a much larger weighting towards the item's value is given than for the other criteria. Weighting of the different criteria will be company dependent, but an even weighting is otherwise recommended. The higher the susceptibility for e-procurement (shown in the right-most column in the above table), the more savings potential it has for implementing e-procurement.

8.1.3. Procurement and –process feasibility

Each of the identified commodity groups probably has a unique procurement process, is purchased by different individuals and has a different consolidation process. It is important to understand the value proposed by using e-procurement. The following important criteria have to be considered:

- *Transaction value.* For each of the commodities the average transaction value (total spent per commodity divided by the number of transactions for the same period) has to be determined. In cases where transactions are not used (JIT environment), the delivery value (average value per delivery) is suggested. The lower the transaction value, the higher the score that has to be assigned.

- *Process inefficiency.* Compared to the proposed e-procurement solution, determine the current process inefficiency. Two alternatives may be used: i) Quantitative, where each commodity's process cost is determined through activity based costing, or ii) Qualitative where a rating is given based on the evaluator's opinion. Due to the extent of such an exercise a qualitative approach is more feasible. Should a qualitative value be used, it is recommended that it ranges from 0 (all products in the commodity group are purchased through a very efficient process) to 5 (all products in the commodity group are purchased through a very inefficient process).

- *Contract purchasing.* Determine what part of the commodity spend is on-contract versus off-contract spending. The higher the percentage off-contract spending, the higher the rating that is assigned. A qualitative value, ranging from 0 (no products in the commodity group are ever purchased off-contract) to 5 (all products in the commodity group are frequently purchased off-contract) is suggested.

An example of rating commodity groups in terms of the above criteria is shown in Table 33.

TABLE 33: PROCESS AND PROCUREMENT FEASIBILITY

Feasibility of Commodity Groups for e-Procurement				
Commodity Group	Avg Transaction Value	Process Inefficiencies	Contract Purchasing	Procurement Feasibility (rating out of 5)
Other stationary	150	1	1	2.00
Lubrication oils	1,000	2	2	1.67
Paints and varnishes	5,000	2	1	2.00
Nuts and bolts	1,500	2	1	1.50

As the average transaction value (column 2 in the above table) is a quantitative value and all others are qualitative, it is recommended to convert the transaction value to a rating out of 5 (otherwise a much larger weighting towards the item's value is given than for the other criteria). Weighting of the different criteria will be company dependent, but an even weighting is otherwise recommended. The higher the procurement feasibility value (shown in the right-most column in the above table), the more the savings that can be realised through implementing e-procurement.



8.1.4. Role player feasibility

For each of the identified commodity groups, the following as discussed in section 4.6 have to be evaluated:

- *Buyer characteristics.* Each of the commodities' buyers involved (such as initiators, users, influencers, deciders, etc.) have to be evaluated. Aspects such as their susceptibility to e-procurement, as well as the existence of purchasing control have to be evaluated. Commodities where the buyers will realise more value through the use of e-procurement have to receive a higher rating. A qualitative value, ranging from 0 (buyers of the products in the commodity group will realise little or no value through using e-procurement) to 5 (buyers of the products in the commodity group will realise a large amount of value through using e-procurement) is suggested.
- *Supplier and channel strategy.* For each commodity group the relationship with its suppliers has to be evaluated (being either cohesive or conflicting). Also the existence of any horizontal or vertical relationships that the buying company is involved in should be considered. Scoring the supplier and channel strategy pivots around the existence of a constructive relationship (high rating) vs. deconstructive relationship (low rating). A qualitative value, ranging from 0 (a highly deconstructive relationship exists between buyers and suppliers of the products in the commodity group) to 5 (a very constructive relationship exists between buyers and suppliers of the products in the commodity group) is suggested.
- *Market forces.* Each commodity is purchased in a market where certain forces prevail (or the absence thereof). It has to be determined whether each commodity is purchased within a perfect- (high rating) or imperfect competitive market (low rating). A qualitative value, ranging from 1 (all products within the commodity group are purchased within an imperfect competitive market) to 5 (all products within the commodity group are purchased within a perfect competitive market) is suggested.

An example of rating commodity groups in terms of the above criteria is shown in Table 34.

TABLE 34: ROLE PLAYER FEASIBILITY

Feasibility of Role Players for e-Procurement				
Commodity Group	Buyer Characteristics	Supplier & Channel strategy	Market Forces	Roleplayer feasibility (rating out of 5)
Office Stationery	4	3	3	4.00
Lubrication oils	3	3	3	3.00
Cables and wires	2	3	1	2.00
Nuts and bolts	3	3	1	2.33

All the above criteria are measured qualitative and no conversion from a quantitative rating is necessary. Weighting of the different criteria will be company dependent, but an evenly weighting is otherwise recommended. The higher the role player feasibility value (shown in the right-most column in the above table), the higher the savings potential it has for implementing e-procurement.

8.1.5. Prioritise Commodity Groups for e-Procurement

The previous three paragraphs discussed different aspects relating to the susceptibility of a commodity group towards an e-procurement solution. Firstly the feasibility of the commodity group, thereafter the procurement and process feasibility and lastly the role player feasibility was determined. All three of these aspects have to be combined into a single rating for the commodity groups. The ratings of the previously discussed aspects as well as a combined susceptibility rating for the commodity groups are shown in Table 35.

TABLE 35: TOTAL E-PROCUREMENT SUSCEPTIBILITY RATING

Total e-Procurement Susceptibility Rating				
Commodity Group	Commodity Group Susceptibility	Process and Procurement Feasibility	Role-Player Feasibility	Susceptibility Rating (rating out of 5)
Office Stationery	3.06	2.38	4.00	3.15
Lubrication oils	3.44	1.67	3.00	2.70
Cables and wires	3.25	2.67	2.00	2.64
Nuts and bolts	1.75	1.50	2.33	1.86

Weighting each of the three sets of criteria depends once again on the company, but an evenly split is recommended. From the above table it is clear that Office Stationery is the most likely to be purchased using an e-procurement solution, while Nuts and bolts are the least likely. Although it is possible to determine which commodity groups to purchase through the e-procurement solution, it is recommended to first determine IT information and architecture needs before making any decisions (this is addressed in the following paragraph).

8.1.6. Information Exchange and Order Initiation Solution

Each of the commodity groups has received three ratings in terms of its susceptibility for e-procurement. Before it is decided which products to procure through an e-procurement solution, the systems and data requirements for such a system should be identified. The following aspects, as addressed in Chapter 6, should be considered:

- *System Platform.* Depending on the number of users as well as suppliers, a choice have to be made between the Intranet, Extranet or Internet. Due to its reach and ease of access the Internet will in most instances be the platform of choice.
- *Systems integration.* The current systems used for purchasing the different commodities has to be evaluated. These could include ERP or legacy systems, EDI solutions, etc. that will determine what integration is required should e-procurement be implemented.
- *Information and data format.* Based on the system integration needs, the data format requirement should be established. In cases where EDI solutions exist, the possibility of using XML and its impact should be evaluated.
- *Business Model.* Companies have to choose between buy-side, sell-side or market place solutions. A choice between catalogue solutions vs. ERP/legacy based solutions will also have to be considered.
- *Order initiation.* Analyse if orders are generated on demand or forecast and how orders are generated (JIT, MRP, by end users, etc.) Also determine if inventory of the commodity is centralised or decentralised and if any inventory information is available. Based on this determine how orders will be initiated.

An example of assigning the preferred information exchange solution according to the above criteria is shown in Table 36.

TABLE 36: INFORMATION EXCHANGE AND ORDER INITIATION SOLUTION

Commodity Group	System Platform	System Integration	Information and Data Format	Business Model	Order Initiation
Construction site	Intranet	ERP	XML	Marketplace & Catalogue	Manual
Construction site	Intranet	ERP & EDI	EDIFACT	Marketplace & ERP	Manual
Plots and beds	Intranet	ERP	XML	Marketplace & ERP	Automatic

In the above table the preferred solution is derived for each of the dimensions discussed. The output of this table now has to be combined with that of Table 35 to determine firstly the preferred e-procurement solution and secondly which products to purchase using the solution. This will be further discussed in the following paragraph.

8.1.7. Commodity feasibility and recommended e-procurement solution

Using the output of the previous two paragraphs, the most feasible solution for each of the aspects discussed in Table 36 (such as Platform, System Integration, etc.) is combined with the total susceptibility rating in Table 35. The recommended e-procurement solution is derived in Table 37.

TABLE 37: RECOMMENDED E-PROCUREMENT SOLUTION BASED ON RATINGS

e-Procurement Solution Rating		
	Solution	Total Rating
Platform	Internet	10.35
System Integration	ERP & EDI	2.64
	ERP	7.71
Information and Data Format	EDIFACT	2.64
	XML	7.71
Business Model	Marketside & Catalogue	5.85
	Marketside & ERP	4.50
Order initiation	Manual	8.49
	Automatic	1.86

To understand the working of the above table, the example of the System Integration requirements is used. Only Cables and Wires need to be integrated to ERP&EDI, while for all other commodity groups integration with only ERP is necessary. Cables and Wires have a susceptibility rating of 2.64, while the combination of all other commodity groups are 7.71 (refer ratings from Table 35).

From the above table the most suited solution should contain the following:

- The Internet should be used as platform.
- Only integration into an ERP system should be required.
- XML as information and data format should be used.
- A market side business model using catalogues should be used.
- Orders need to be generated manually rather than automatically



Referring back to Table 36, only the commodity groups Office Stationery and Lubrication Oils suit all the solution architecture requirements. Therefore only Office Stationery and Lubrication Oils should be purchased using an e-procurement solution.

Using the recommended e-procurement solution, information should be used to research current e-procurement offerings and determine which solution addresses the IT requirements best. Should no solution adequately fit, the possibility of developing a new system should also be considered.

8.2. Chapter Conclusion

The Sasol Funnel Model is primarily an implementation model and therefore the need remains for an evaluation model. The proposed framework aims to thoroughly evaluate all procurement related aspects, such as product, role-player and process susceptibility in recommending the products to be procured using the solution. The information architecture and required integration for different products are also ranked. The proposed framework combines all the information to assist companies in choosing the applicable products to be purchased using e-procurement technology and determines the most suitable e-procurement information architecture.

Although the evaluation of different “off the shelf” solutions are not explicitly addressed in the framework, it indicates the most critical aspects that should be used to compare different alternatives. The following evaluation methodology is suggested:

- Rank the different criteria according to importance (the main criteria should be the required platform, data format, integration necessary, business model and ordering triggering).
- Determine if the solution addresses the criteria and if it does, how well the criteria are addressed (a qualitative rating from 0 to 5 could be used).
- From the rating, determine the most suited solution.

Should no “off the shelf” solution adequately suite the criteria, the process aims to specify the important aspects to be considered in developing a new solution.



CHAPTER 9

CONCLUSION



9. CONCLUSION

9.1. Summary

In this study numerous aspects relating to procurement and the electronic transacting thereof were discussed. As procurement is interrelated to many other disciplines, a detailed analysis of each discipline was made and the appropriateness of e-procurement was discussed.

In Chapter 2 traditional procurement and the traditional procurement process were discussed. Its main objective within business as well as different buying situations and purchasing dynamics also received attention. Throughout the chapter the impact and suitability of e-procurement were discussed. The chapter concluded that e-procurement definitely addresses streamlining the purchasing action, but has little focus on the strategic sourcing of supply. A model was presented that provides a wider product scope for e-procurement than currently used.

In Chapter 3 all aspects regarding the type of products procured, the need they fulfil, as well as their importance in different industries were discussed. Other aspects such as buying new vs. second hand as well as buying methods were also analysed. Products were divided into two broad categories, namely direct and indirect goods. The chapter concluded with a matrix that takes into consideration: i) The function of the product within the organisation, ii) The product characteristics (homogenous or heterogeneous), iii) The product value and iv) The number of suppliers. Indirect goods, with a lower unit value, supplied by a large number of homogenous suppliers were regarded as superior for e-procurement application.

Chapter 4 focussed on the different role players (buyers and suppliers) in the procurement process, as well as the role and value of each. The typical buyer-supplier relationships in industry were determined as well as each role and value in an e-procurement environment. The applicability of e-procurement is dependent on the buy- and supply relationship, which in turn is a function of: i) The Buyer characteristics (demography and background), ii) The Supplier characteristics and channel strategy (the supplier's position in the value chain and the nature of the relationship as either cohesive or conflicting), iii) The Market forces (supply and demand laws and market competitiveness) and iv) Industry related purchasing (the product purchased and its significance).



In Chapter 5 the impact of supply chain management on purchasing were discussed. Firstly, changes in the value chain since the introduction of the Internet as well as CPFR, were discussed. Materials management aspects were considered, discussing order and inventory control systems, receiving, EOQ and demand planning. Thereafter the right supply chain for the right product was discussed. It became evident that sufficient information should be available to properly plan and automatically order items. MRP-logic was proposed, which could be rolled out to indirect goods should sufficient inventory- and demand forecasting information be available.

In Chapter 6 the information and IT related aspects necessary for an appropriate e-procurement solution were discussed. The chapter addressed aspects such as the correct data format (XML vs. EDIFACT, etc.), information platform (Internet vs. Intranet, etc.), integrating with back-end systems such as an ERP system, securing systems and information and different e-procurement solutions. All these aspects were combined with the commerce arena (the product characteristics, sophistication of the buyers as well as inefficiencies of current transactions) in a decision framework. The framework guides users to establish the commerce arena requirements, which will influence the choice in e-procurement business model, trading platform, data format, etc.

In Chapter 7 the e-procurement decision and implementation approach followed by Sasol was investigated. All of the aspects addressed throughout the document were investigated at Sasol. The chapter started off by giving background to both the company as well as the functioning of procurement within the company. The improvements made by e-procurement followed, discussing the impact on the current purchasing structure, current procurement processes, as well as products being procured using the system. Integration with ERP systems and the combined working of the ERP and e-procurement solutions were also discussed. The final part of the chapter explained the Funnel Model developed by Sasol to determine the products that should be purchased through the e-procurement solution and also to prioritise roll-out of the solution within the different business units.

Chapter 8 proposed a framework for implementing e-procurement. The framework is initiated by grouping products with similar profiles and ranking each in terms of the suitability for e-procurement. For each of these commodity groups the value of implementing an e-procurement solution, based on the current channel role-players and –relationships, was determined. Also the required information exchange format and architecture was determined. Based on all these factors, the framework established the most suitable commodity groups and the required architecture of a preferred e-procurement solution.

9.2. Comparison of the Proposed Framework and the Funnel Model

Although the proposed framework in Figure 50 in Chapter 8 has similarities to the Funnel Model used by Sasol (refer section 7.9), the Funnel Model is primarily an implementation tool, whereas the framework developed in this research is an evaluation tool.

Unlike the Funnel Model, the developed framework does not initiate with a set solution. It rather analyses a company's total procurement (focussing on aspects such as products, processes and existing systems) to determine the susceptibility for e-procurement. Criteria developed also assists in recommending the required integration as well as data format and information architecture. The proposed framework establishes the most important criteria to evaluate e-procurement solutions. Should no "off the shelf" solution be adequately fit the set criteria, a new solution can be based on the specifications set out by the framework.

The choice of solution, as well as outputs from the proposed model, can be used as an input to the Funnel Model (removing the first product rating stage). This will enable the formulation of a roll-out plan for the solution. The proposed framework therefore does not aim to replace the existing Funnel Model, but rather it aims to complement it and function as an extension in choosing and rolling out the most feasible e-procurement solution.

9.3. Suggested Further Research

Further research could be undertaken on the following topics:

- e-Procurement and payment solutions.
- e-Procurement and e-Fulfilment.
- Feasibility of centralising indirect goods' storage from where individual departments can order when needed.
- Total Cost of Ownership evaluation for using an e-procurement solution.
- Integration between existing solutions and e-procurement, as well as the use of middleware.
- Acceptability of e-procurement by the South African SMME market.
- Change management of both users and suppliers in implementing an e-procurement solution.
- M-Commerce procurement needs and feasibility.



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